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A REVISION OF THE BURMESE PARADOXOSOMATIDAE
(DIPLOPODA, POLYDESMIDA) IN THE MUSEO CIVICO
DI STORIA NATURALE AT GENOA (PART I) ¹⁾

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Abstract

This paper treats part of the Paradoxosomatidae from Burma described by Pocock, 1895, many of which were considered species incertae sedis up to now. All species examined are redescribed and illustrated. The genus *Agnesia* Attems, 1953, is redefined and its relationship discussed. The species of the genus *Anoplodesmus* Pocock, 1895, are briefly surveyed and their interrelationships discussed. The discontinuous area of the genus is shown in a map. The genus *Trogodesmus* Pocock, 1895, is redefined; *Attemsina* Hoffman, 1963, is considered to be a junior synonym. The Oriental Paradoxosomatidae characterized by the presence of a femoral tubercle in the first pair of legs of the male are reviewed and their relationships discussed. The genus *Tetracentrosternus* Pocock, 1895, which belongs to this group, is redefined, and a new genus, *Pocockina*, for *Orthomorpha pilifera* Pocock, 1895, also belonging to this group, is established.

Our knowledge of the millipede fauna of Burma largely goes back to the work of Pocock. This author published in a series of papers (1890, 1893, 1895, 1896), the results of his studies based on the precious material of the expedition by the famous Italian collector LEONARDO FEA to that country.

Pocock's descriptions of the many new species in this collection were, as regards the verbal part, sufficiently adequate for those days. However, failing a clear apprehension of the systematic importance of the male gonopods, his drawings of these organs are practically useless. In consequence, the taxonomic status of most of the species remained dubious, and the diplopod fauna of Burma in effect is still largely an enigma.

The Paradoxosomatidae of the FEA collection filled most of the 1895 paper. Out of 34 recorded species, 32 were described as new, and of the 7 genera dealt with, 5 were new.

With this, the importance of a re-examination of these paradoxosomatids is sufficiently explained.

In the spring of 1964 I had the opportunity to study the Paradoxosomatidae in the collection of the Genoa Museum, where most of the diplopod types of the FEA collection were supposed to be.

Of course, not the entire material upon which Pocock based his report could be

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located. The author certainly had his share of the available duplicates, and these are probably in the British Museum (Natural History) now. Moreover, some specimens appear to have been traded to the Hamburg Museum (WEIDNER, 1960). Finally, it was found in Genoa that material of some species, amongst it unfortunately some very important types, was borrowed by SILVESTRI in 1902 and was never returned. This material presumably is still in the SILVESTRI collection in the Laboratorio di Entomologia Agraria at Portici (JEEKE, 1965).

Nevertheless, the great majority of the species described by POCKOCK could be re-examined, as is shown in the list below.

LIST OF BURMESE PARADOXOSOMATIDAE DESCRIBED OR RECORDED BY
POCKOCK, 1895

Names printed in Clarendon type refer to species of which there is no material in the Genoa Museum, but which are most probably in the British Museum (Natural History) of London. Names between brackets refer to species of which the material should be in Genoa, but which are now probably in Portici. The species marked with an asterisk have been re-examined, the results being published in the present paper. The other species will be treated in a subsequent paper.

<i>(Eudasyptis pusillus</i> Pocock)		<i>(Orthomorpha minlana</i> Pocock)	
* <i>Anoplodesmus anthracinus</i> Pocock	—	<i>karschi</i> (Pocock, 1889)	
* — <i>striolatus</i> Pocock	—	<i>insularis</i> Pocock	
* — <i>pinguis</i> Pocock	—	<i>clivicola</i> Pocock	
* — <i>obesus</i> Pocock	—	<i>palonensis</i> Pocock	
<i>(Strongylosoma ocellatum</i> Pocock)	—	<i>monticola</i> Pocock	
* <i>Tetracentrosternus subspinosus</i> Pocock	—	<i>gestri</i> Pocock	
<i>(Trogodesmus bicolor</i> Pocock)	—	<i>oatesii</i> Pocock	
* — <i>vittatus</i> Pocock	—	<i>fuscocollaris</i> Pocock	
* — <i>nigrescens</i> Pocock	* —	<i>doriae</i> Pocock	
* <i>Orthomorpha bisulcata</i> Pocock	* —	<i>silvestris</i> Pocock	
— <i>coarctata</i> Saussure, 1860	<i>Prionopeltis planatus</i> Pocock		
* — <i>pilifera</i> Pocock	(— <i>taurinus</i> Pocock)		
* — <i>coxisternis</i> Pocock	— <i>cervinus</i> Pocock (a re-		
— <i>miranda</i> Pocock			description of this
— <i>melanopleuris</i> Pocock			species was publish-
— <i>bistriata</i> Pocock			ed recently (JEE-
— <i>bivittata</i> Pocock			KE, 1964)

I take pleasure in acknowledging my sincere gratitude to Professor Dr. E. TORTONESE and Miss Dr. DELFA GUIGLIA, Director and First Curator, respectively, of the Genoa Museum, for providing ample facilities for my work in the collections of that Museum.

Agnesia Attems

1937 *Anoplodesmus* in part; Attems, Tierreich 68 : 98.

1953 *Agnesia* Attems, Mém. Mus. nat. Hist. nat. (n.s.) [A] 5 : 174.

1953 *Anoplodesmus* in part; Attems, l.c.: 163.

Type-species.

Agnesia nodulipes Attems, 1953, by original designation.

Diagnosis.

20 somites; poreformula normal. Head without particulars. Antennae of moderate length, somewhat clavate. Collum distinctly wider than the head.

Somites rather weakly to moderately constricted. Stricture of moderate width to rather broad. Metatergites with a rather deeply impressed transverse furrow from the 4th or 5th somite onwards. Pleural keels only in the anterior half of the body or up to the 16th or 17th somite.

Lateral keels well developed, those of the 2nd somite below the level of those of the 3rd. Posterior edges of the keels produced caudad in all somites. Lateral margins at least with traces of an indentation.

Sternites of the somites of the middle of the body about as long as wide in the male, broader than long in the female. Sternal cones weakly developed or absent. Sternite of the 5th somite of the male between the anterior legs with a short, broad process, which is more or less incised in the middle. Sternite of the 6th somite somewhat modified in the male. Legs rather long. Tibial and tarsal brushes present up to the middle of the body, or absent. First leg of the male without modifications. Generally a number of podomeres in the middle part of the body of the male are provided with one or more ventral tubercles.

Gonopod coxa moderately developed. Gonopod prefemur well developed, somewhat elongate, laterally well demarcated from the femur. Femur well developed, widening considerably in the distal direction. Spermal channel running along the medio-anterior side towards the base of the solenomerite. Postfemoral region distinctly demarcated laterally. Solenomerite arising from the medio-anterior side of the distal end of the femur; at the anterior side of the base of the solenomerite the femur protrudes slightly or is produced into a spine-like process. Postfemur with one or two processes of variable size; the lateral margin of the postfemur is cristate and projects distad of the base of the tibiotarsus. Tibiotarsus a simple solenophore without secondary processes; lamina medialis and lamina lateralis both well developed, sheathing the flagelliform solenomerite for its greater part, curving caudad first, then laterad and finally cephalad.

Remarks.

In a tentative arrangement of the species hitherto referred to *Orthomorpha* and *Pratinus* (JEEKEl, 1963) I argued the necessity of excluding *Orthomorpha doriae* Pocock from the genus *Orthomorpha*. The re-examination of the type material of this species and of the even more enigmatic *Orthomorpha silvestris* Pocock now shows that these two species have nothing to do with *Orthomorpha* in the present-day concept of that genus, and that they are referable to the genus *Agnesia* Attems.

Agnesia was established by ATTEMS in 1953 to include a single species: *A. nodulipes* Attems, 1953, from Indochina. With this evidence at hand, however, it seems better to widen somewhat the concept of this genus.

Actually, it is strange that ATTEMS himself did not notice the obvious relationship between *Agnesia nodulipes* and two Indochinese species he erroneously associated with *Anoplodesmus*, namely *Anoplodesmus hilaris* Attems and *Anoplodesmus mutilatus* Attems, the latter of which he described in the very same paper.

A critical examination of the descriptions of *nodulipes*, *bilaris*, and *mutilatus* gives only one important character for separating *nodulipes* from the other two species, i.e., the spiniform process at the end of the gonopod femur, arising cephalad of the base of the solenomerite. However, as *bilaris* and *mutilatus* have a distinct rounded protrusion at the corresponding place, this character loses much of its importance.

Another conspicuous feature of *Agnesia nodulipes* are the ventral tubercles of several podomeres of a number of legs. Similar tubercles, however, have been observed in *Anoplodesmus bilaris*, although they are somewhat less obvious in that species. The description of *mutilatus*, unfortunately, is not concrete on this point.

All things considered, I prefer to bring *bilaris* and *mutilatus* under the heading *Agnesia* rather than create for them a new, necessarily weakly defined genus.

As for the present reference to *Agnesia* of the two species from Burma described by Pocock, it is quite easy to see that *doriae* must be closely related to *bilaris*. The gonopods have the same general morphology, and many other non-gonopod characters appear to be in close agreement, e.g., the general structure of the legs of the male, including the ventral tubercles. The other species, *silvestris*, on the whole may seem a little more disjunct from the rest, yet its gonopods prove its close relationship with *bilaris*, *mutilatus* and *doriae*.

In recapitulation, the genus *Agnesia* now consists of the following species:

Agnesia nodulipes Attems, 1953 (Mém. Mus. nat. Hist. nat. (n.s., A) 5 : 174, fig. 70—74) — Indochina.

Agnesia bilaris (Attems, 1937) (Tierreich 68 : 105, fig. 136; 1938, Mém. Mus. nat. Hist. nat. (n.s.) 6 : 215, fig. 39—41) — Indochina.

Agnesia mutilata (Attems, 1953) (Mém. Mus. nat. Hist. nat. (n.s., A) 5 : 163, fig. 45—46) — Indochina.

Agnesia doriae (Pocock, 1895) — Burma.

Agnesia silvestris (Pocock, 1895) — Burma.

A slight discrepancy in the gonopod terminology still needs some explanation. In his descriptions of *bilaris* and *mutilata*, ATTEMs points out that a postfemoral region is not demarcated in the gonopods of these two species. On the other hand, he maintains that the tibiotarsus of both species is distinctly subdivided into a tibia and a tarsus. According to my interpretation, however, the so-called tibial part of the tibiotarsus represents the postfemoral region of the gonopods. The tarsal section of the tibiotarsus according to ATTEMs's interpretation, in my opinion constitutes the whole of the tibiotarsus.

In his description of the gonopods of *nodulipes*, ATTEMs likewise states that a postfemoral region is not demarcated. In this case he designates as tibiotarsus what actually seems to be the postfemur (whether this is marked off from the femur or not, needs to be verified) and the tibiotarsus, together.

In consequence of his interpretation, ATTEMs named tibial or tibiotarsal processes what I have regarded here as postfemoral processes.

All this may seem a rather unimportant and arbitrary matter of interpretation. Actually, however, the present interpretation of the gonopod structure enables us at once to ascertain the relationship of *Agnesia* and *Oxidus* Cook, 1911.

The gonopods of *Oxidus gracilis* (C. Koch, 1847) have been more than once

adequately illustrated (see, for instance, ATTEMS, 1937 : 82, fig. 101; ATTEMS, 1940 : 273, fig. 1—2). On comparison of these drawings with the gonopod drawing of *Agnesia doriae* (fig. 5) it is easy to see that there exists a great resemblance in the configuration of the femoral and postfemoral regions in these two species. In *Oxidus*, however, the denomination of the parts of the gonopods by ATTEMS is almost entirely in agreement with the homologization adopted here for *Agnesia* ! It goes without saying that, whereas the actual names of the various parts of the gonopods are relatively unimportant, any inconsistency as regards the denomination renders a comparison of homologous structures practically impossible.

Although *Agnesia* thus seems quite closely related to *Oxidus*, there is an evident difference in the distal part of the gonopods: in *Oxidus* there is, aside from a postfemoral process (marked *Tib* in the cited drawings by ATTEMS, 1940), a long branch which may be regarded as a secondary process of the tibiotarsus (marked *Ti* by ATTEMS). Moreover, the ventral tubercles of the legs are lacking in *Oxidus*.

Also closely related to *Agnesia* appears to be the genus *Sichotanus* Attems, 1914, occurring in Eastern Siberia and Korea. In this genus the end of the gonopod femur has, cephalad of the course of the spermal channel, an elongate process directed meso-caudad, which reminds strongly of the corresponding process in *Agnesia nodulipes*. The lateral side of the distal end of the postfemoral region (whether a postfemur is demarcated or not is not clear) is cristate as in *Agnesia*, although more produced distad and projecting as a triangular process. The tibiotarsus in *Sichotanus* is typically curving laterad as in *Agnesia*.

In a way related to *Agnesia* appears to be, furthermore, *Sundanina sigma* Attems, 1953, from Indochina. The gonopods of this species seem to represent a somewhat simplified *Agnesia* type. They have the typically curved tibiotarsus, a demarcated postfemoral region which at the caudal side of the distal end is produced into a little spine, which strongly suggests a similar spine in *Agnesia nodulipes*. Other postfemoral processes are lacking, and it is not clear whether or not the postfemur is laterally cristate.

It must be emphasized here, and it will be evident from the preceding lines, that the whole matter of defining the interrelationships of these East Asiatic paradoxosomatid genera is still extremely difficult and unsatisfactory, due partly to the inadequate exploration of the region and partly to the shortcomings of many of the descriptions.

KEY TO THE SPECIES OF *Agnesia*

1. Gonopod femur, cephalad of the base of the solenomerite, produced into a spiniform process. Some legs with ventral tubercles in the five distal podomeres *A. nodulipes* Att.
- Gonopod femur, cephalad of the base of the solenomerite, with a rounded protrusion. Only up to two podomeres provided with ventral tubercles 2
2. Gonopod postfemur with a single small process *A. doriae* (Poc.)
- Gonopod postfemur with an elongate process or with two processes 3
3. Prefemur of the pregonopodial legs not conspicuously incrassate. Gonopod postfemur with a single process *A. silvestris* (Poc.)

- Prefemur of the pregonopodial legs much incrassate, dorsally strongly convex.
 Gonopod postfemur with two processes 4
4. Width 5.0 mm. Lateral border of the lateral keels with one distinct indentation *A. bilaris* (Att.)
- Width 2.8 mm. Lateral border of the lateral keels with two indistinct indentations *A. mutilata* (Att.)

Agnesia doriae (Pocock)

1895 *Orthomorpha doriae* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 823, fig. 19—19a.
 1937 *Orthomorpha* (*O.*) *doriae* ; Attems, Tierreich 68 : 80.

Material.

This species was based on an unrecorded number of specimens from Yado, Biapo, Meteleo, and Puepoli, all collected by FEA. The type, according to Pocock, came from Meteleo. This material now seems to be scattered over several museums. WEIDNER (1960) mentions three paratypes from Puepoli in the Hamburg Museum. In the British Museum I noted several years ago four specimens.

In the Genoa Museum I studied the following material: Meteleo, Carin Cheba, 900—1100 m, 1 ♂, 1 ♀; Yado, 1 ♂, 1 ♀; Carin Cheba, 900—1100 m, 2 ♂, 1 ♀, 1 juv. ♂. The male specimen from Meteleo I have selected as lectotype, the others I labelled as paratypes.

Description.

Colour. — Pocock described the colour of the head and the dorsal surface as piceous or very deep brown; this has faded now to dull brown.

Width. — ♂ : 3.2 mm; 2.9 mm; 3.4 mm, 2.9 mm. ♀ : 3.4 mm; 3.6 mm; 3.3 mm. Juv. ♂ with 19 somites: 2.3 mm (sequence in the order of the above enumeration).

Head and antennae. — Labral emargination rather deep and moderately wide; labrum tridentate. Clypeus moderately convex, rather strongly impressed towards the labrum; the lateral border widely rounded, a little concave near the labrum. Headplate moderately shiny, rather densely setiferous up to above the antennal sockets; vertex somewhat rugulose, with three pairs of hairs. Antennal sockets separated by the diameter of a socket, or by nearly three quarters of the length of the 2nd antennomere. Postantennal groove rather deep; the wall in front rather prominent. Vertex moderately convex, distinctly demarcated from the frontal region by a transverse depression. Vertigial sulcus rather well impressed, running downward to just above the level of the antennal sockets. Antennae of moderate length, rather stout, somewhat clavate. Pubescence rather dense proximally to dense distally. Length of antennomeres: $2 = 3 > 4 > 5 > 6$; the 6th antennomere nearly three quarters of the length of the 2nd.

Collum. — Distinctly wider than the head, subtrapezoidal in dorsal outline. Anterior border faintly concave in the middle, evenly convex towards the lateral sides. Posterior border weakly concave, faintly rounded or almost straight laterally and with a notch above the lateral rounding. Lateral border widely and symmetrically rounded, with a weak setiferous notch cephalad. Surface shiny, very faintly rugulose, some hairs may be present and are situated on faint prominences.

Marginal rim laterally narrow. Middle weakly transversely convex, more convex laterally, but concave at the base of the lateral keels which are raised a little but do not reach a horizontal level.

Somites. — Constriction rather weak. Prosomites silky, sharply demarcated from the stricture. Stricture of moderate width, finely but distinctly ribbed dorsally, indistinctly striolate below the level of the lateral keels. Metatergites shiny, irregularly rugulose. Transverse furrow present from the 5th to the 18th somite, weakly indicated on the 4th somite, rather deeply and widely impressed. In most somites also a faint median furrow. Behind the stricture a transverse row of four flattened granules, which are setiferous only in a few anterior and posterior somites. In front of the caudal margin of the tergites a similar row of four granules, which, however, are less distinct than those of the anterior row. In the 18th somite only the two rows are equally distinct. Sides finely and densely granular. Pleural keels of the 2nd to 4th somites represented by distinct, somewhat curved ridges which are caudally produced into an acute, pointed triangular lappet which projects caudad of the posterior margin of the somites. From the 5th somite onwards there is only a triangular lappet near the posterior margin of the segments which projects a little behind that margin. In the 16th somite the lappet does not project behind the margin; in the 17th somite the lappet is indicated weakly.

Lateral keels. — (fig. 1). 2nd somite a little wider than the collum, and distinctly wider than the 3rd somite. 4th somite as wide as the 3rd. Keels of the 2nd somite a little below the level of those of the 3rd, horizontal. Anterior margin widely convex; the latero-anterior edge obtusely angular, produced into a blunt lateral tooth at the posterior side of which arises a hair. Lateral margin widely rounded, with two indentations and the indication of a third. Posterior border widely rounded; the latero-posterior edge about right-angled, projecting caudad of the posterior border of the somite. Marginal rim narrow, weakly defined except along the anterior border. Keels of the 3rd and 4th somites subsimilar, those of the 3rd anteriorly rather widely rounded, those of the 4th more widely rounded; the lateral borders in both somites faintly convex, with two indentations, the first of which bears a hair. Posterior edges projecting behind the posterior margins in both somites. Marginal rims thicker than those of the keels of the 2nd somite. The keels raised slightly above the horizontal level. Keels of the 5th and subsequent somites all distinctly raised above the horizontal level but not above the middorsal level. Anterior borders more or less widely rounded, the lateral borders weakly convex to practically straight, with two indentations. Posterior edges projecting caudad of the margin of the somites. In subsequent segments the edges become more and more acute-angled and more pointed, in particular in the 15th, 16th and 17th somites, the posterior points scarcely directed mesad. Marginal rim of the keels rather thick dorso-ventrally. Pores laterad and slightly dorsad, situated dorso-caudad of the second tooth in a distinct, elongate excavation of the rim.

Sternites and legs. — Sternites of middle somites one and one eighth times longer than broad. Cross impressions distinct, moderately impressed, the transverse furrow scarcely deeper than the longitudinal one. No distinct sternal cones, though traces of these may be visible. Pubescence rather dense to moderate. Sternite of the 5th somite with a short, broad process, two times broader than long, the middle

weakly incised. In lateral aspect the process has a low conical outline. Anterior side densely setiferous, without brush. Transverse furrow and longitudinal furrow in the posterior part of the sternite weakly impressed, the posterior part otherwise without particulars. Sternite of one somite deeply excavated medially, although

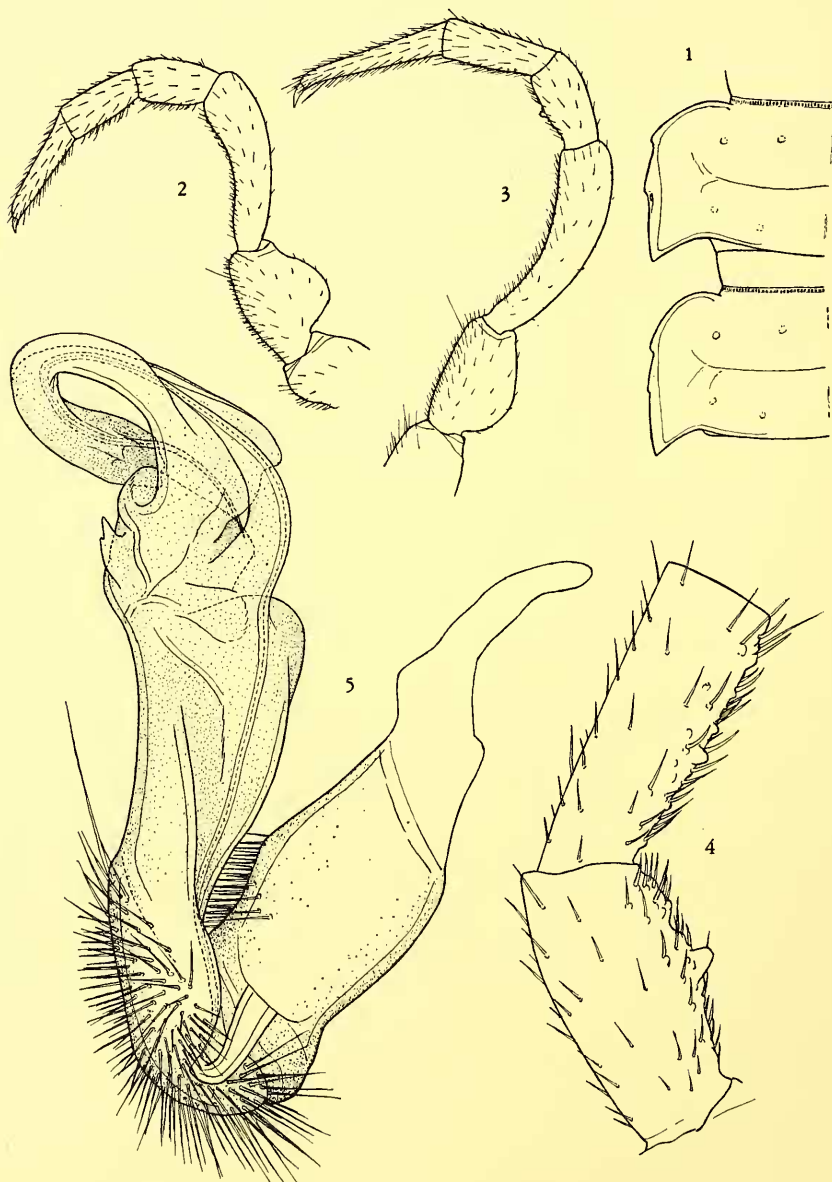


Fig. 1—5. *Agnesia doriae* (Pocock), lectotype ♂. — 1: left side of the 10th and 11th somites, dorsal aspect. 2: right leg of the 7th somite. 3: right leg of the 2nd pair of the 16th somite. 4: postfemur and tibia of same. 5: right gonopod, mesal aspect

not yet level with the ventral side of the metasomal ring. Pubescence moderate, near the base of the coxae a tuft of setae. Sternites of the 7th and 8th somites without particulars. Legs (fig. 2—4) rather long, rather stout. Prefemora strongly incrassate, much convex dorsally, except in the last two pairs of legs. Femora arched. Last two pairs of legs somewhat shorter than the preceding legs. The legs of the 6th or 7th to 17th somites are provided with postfemoral tubercles, those of the 8th to 17th somites also with tibial tubercles. Moreover, the ventral side of the femora, postfemora and tibiae is rather densely covered with fine granules. Pubescence of the legs weak to moderate dorsally and dense ventrally, especially in the anterior legs. No typical brushes. Length of podomeres: $3 > 6 > 2 > 5 = 4$; the 6th podomere just over three quarters of the length of the 3rd.

Anal somite. — Epiproct rather thick; the sides converging concavely to become practically parallel near the end. Lateral preterminal setiferous tubercles distinctly developed. The end with a pair of well developed rounded terminal knobs, rather narrowly separated. Valves with moderately high and rather narrow rims, rugulose, the setiferous tubercles flattened. Hypoproct semicircular, the tubercles distinctly developed, projecting a little outside the margin but not equalling the middle.

Gonopods. — (fig. 5). Coxa with an anterior setiferous area; the distal end scarcely bent caudad. Demarcation between prefemur and femur very oblique. Postfemur with a small, slightly bifid, posterior process; the lateral carina not serrulate.

Female. — Similar to the male, but differing, aside from the usual sexual characters, as follows. Antennal sockets separated by three quarters of the 2nd antennomere. Sides of the collum not raised. Dorsum more convex. Pleural keels projecting behind the margin of the somite only in the 2nd and 3rd somites, slightly produced caudad in the 4th and 5th somites. From the 6th to the 14th somite only a minute, obtuse-angled lappet near the posterior margin. These lappets are slightly indicated only in the 15th to 17th somites. Lateral keels comparatively less developed and less produced caudally; the posterior edges projecting behind the margin in the 2nd to 4th and in the 9th and subsequent somites, particularly in the 16th and 17th. Sternites of the middle somites over one and one-quarter times broader than long. Legs rather slender, the prefemora not incrassate, the femora straight. No postfemoral and tibial tubercles, no granules. Pubescence moderate, rather dense in the distal podomeres only. Relative length of podomeres as in the male.

Remarks.

In the incrassate prefemora of the anterior legs of the male this species approaches *A. hilaris* (Att.) and *A. mutilata* (Att.). The male of *hilaris*, moreover, has the same distribution of the ventral tubercles of the legs, similar granulation of the ventral side of the podomeres, and the arched femora. Unfortunately, the description of *mutilata* remains silent on these points.

From these two species, *doriae* is at once distinguished by only one small post-femoral process in the gonopods, as against two in *hilaris* and *mutilata*. The metatergites in the latter two species apparently lack the two transverse rows of tubercles on the metatergites. From *hilaris*, *doriae* differs furthermore by its smaller size and by the two instead of one indentations of the border of the lateral keels.

Agnesia silvestris (Pocock)

1895 *Orthomorpha silvestris* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 824.

Material.

This species was based on two specimens, which are both in the Genoa Museum: Village of Thao, Carin Ghecu, 1200—1400 m, IV. 1888, 1 ♂, 1 ♀. The male I have labelled as lectotype, the female as paratype.

Description.

Colour. — Pitch black according to Pocock, but now faded to the same dull brown colour as *doriae*.

Width. — ♂ : 3.6 mm. ♀ : 4.0 mm.

Head and antennae. — As in the preceding species, but the antennal sockets separated by a little more than the diameter of a socket or by three fifths of the length of the 2nd antennomere.

Collum. — As in *doriae*, but the lateral border without a setiferous notch. The lateral keels less raised.

Somites. — Stricture rather broad, not ribbed, but dorsally only indistinctly striate and laterally without sculpture. Surface of metatergites duller than in *doriae*, irregularly rugulose. No distinct tubercles in front of the transverse furrow; the tubercles along the posterior border indistinct as in *doriae*. Transverse furrow present from the 5th to the 17th segment, more sharply but less deeply impressed than in *doriae*. Pleural keels projecting behind the margin of the somite also in the 17th somite, and indicated also in the 18th.

Lateral keels. — (fig. 6). 2nd somite wider than the collum, and narrower than the 3rd. Keels of the 2nd somite a little declined. Lateral border without indentations, only with a tooth at the latero-anterior edge. Latero-posterior edge obtuse, narrowly rounded. Keels of the 3rd somite horizontal. The latero-anterior tooth very weak, no lateral indentations. Keels of the 4th somite without indentations. Keels of the 5th and subsequent somites horizontal. The lateral borders with only one single, often very weak, indentation. The posterior edges becoming gradually more acute-angled, but not pointed as in *doriae*. Pores situated much more dorsad than in *doriae*.

Sternites and legs. — Sternites of middle somites about as long as wide. Postgonopodial sternites with obtuse cones at the base of the legs, those at the base of the caudal legs of each somite pointed and directed caudad. Pubescence moderate. Process of the sternite of the 5th somite shorter than in *doriae*. Sternite of the 6th somite only weakly excavated. Legs (fig. 7) with prefemora not conspicuously incrassate, the femora scarcely arched. Legs of the 6th to 16th somites provided with tibial and tarsal tubercles, weak in the 16th somite. Tibial and tarsal brushes present up to about the middle of the body, dense in the pregonopodial legs.

Anal somite. — Epiproct without lateral preterminal tubercles and with weakly developed terminal knobs. Hypoproct with an obtuse-angled median edge; the setiferous tubercles less distinct than in *doriae* and not projecting outside the margin.

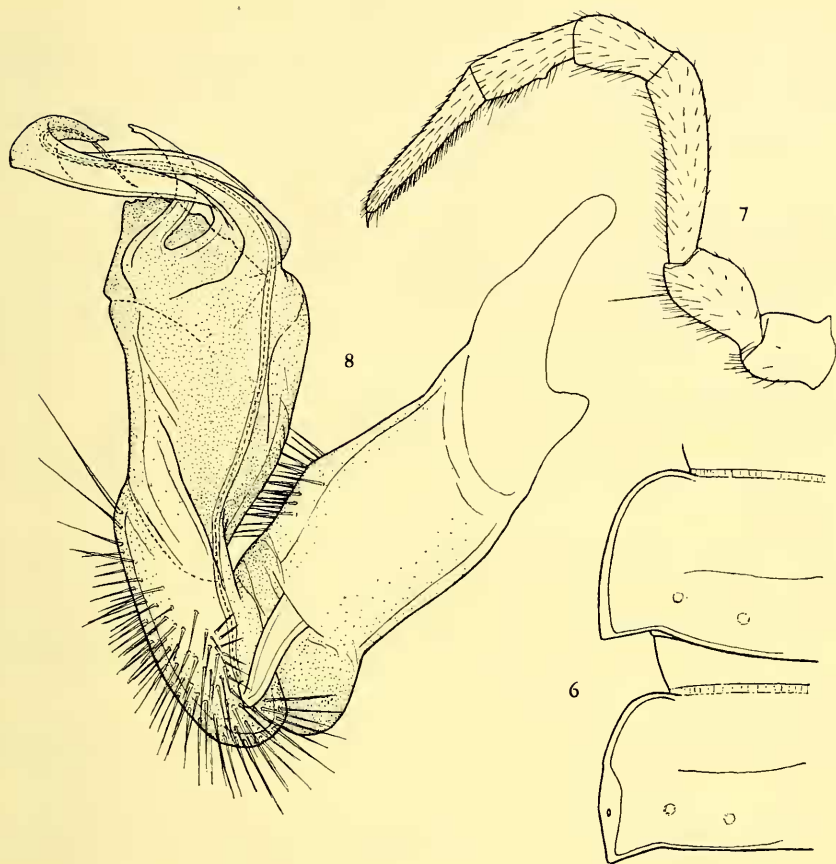


Fig. 6—8. *Agnesia silvestris* (Pocock), lectotype ♂. — 6: left side of the 11th and 12th somites, dorsal aspect. 7: right leg of the 7th somite. 8: right gonopod, mesal aspect

Gonopods. — (fig. 8). The femur shorter and broader than in *doriae*. Post-femur with an elongate, sigmoid process; the lateral carina serrulate.

Female. — Similar to the male, but, aside from the usual sexual features, differentiated as follows. Antennal sockets separated by three quarters of the length of the 2nd antennomere. Sides of collum not raised. Dorsum more convex. Pleural keels projecting behind the posterior margin in the 2nd to 5th somites only. From the 8th to the 16th somite the lappet is obtuse-angled, in the 17th it is almost absent. Lateral keels comparatively less developed. The latero-anterior indentations are distinct in the 2nd and subsequent somites, but are scarcely noticeable in some somites in the caudal half of the body. Posterior edges of the keels not or scarcely projecting behind the margin in the 4th to 8th somites. Sternites in the somites of the middle of the body over one and two fifths times broader than long. Sternal cones very weakly developed. No ventral tubercles in the podomeres. Pubescence of the legs as in the male. The legs stouter than in the female of *doriae*.

Remarks.

In the gonopods this species appears somewhat disjunct by the rather conspicuous development of the lateral crest of the postfemur. For the rest, the whole structure of the gonopods is in close agreement with the other species of *Agnesia*.

Anoplodesmus Pocock

1895 *Anoplodesmus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 797.

1898 *Sulciferus* Attems, Denkschr. k. Akad. Wiss., math.-naturw. Cl., 67 : 346.

1936 *Jonespeltis* Verhoeff, Rec. Ind. Mus. 38 : 115.

1937 *Anoplodesmus* in part; Attems, Tierreich 68 : 98.

Type-species.

Anoplodesmus : *Anoplodesmus anthracinus* Pocock, 1895, by subsequent designation by SILVESTRI, 1896 (Ann. Mus. civ. Stor. nat. Genova 36 : 197).

Sulciferus : *Anoplodesmus anthracinus* Pocock, 1895, by present designation.

Jonespeltis : *Jonespeltis splendidus* Verhoeff, 1936, by monotypy.

Remarks.

The name *Sulciferus* was proposed by ATTEMS for a kind of "supergen" to embrace *Anoplodesmus* Poc., *Prionopeltis* Poc. and *Levizonus* Att. As regards the status of the name ATTEMS was rather inconsistent. Although *Anoplodesmus*, *Prionopeltis* and *Levizonus* were regarded as subgenera, they were treated as generic names in connection with the names of the species. Later, *Sulciferus* was completely discarded and soon entirely forgotten.

As no type-species has been designated previously, I have thought it best to make *Sulciferus* an objective synonym of *Anoplodesmus* by designating *anthracinus* as type.

After the reallocation of *Anoplodesmus bilaris* Att. and *A. mutilatus* Att. in the genus *Agnesia*, *Anoplodesmus* has become a fairly homogeneous genus. It has a discontinuous range, with a group of species occurring in Ceylon and peninsular India and another group living in an area which extends from Burma to Sumatra. One species, moreover, has been recorded from Mauritius, but this occurrence is undoubtedly due to introduction.

The gonopods of the species of this genus are quite similar and generally do not give distinct specific characters. Moreover, a slight alteration of the position of the gonopod when studied may change the outline to such an extent that an uncritical comparison of the published drawings inevitably must lead to entirely wrong conclusions. A correct identification of the species is furthermore impeded by the vagueness of most descriptions.

Inadequacy of the pertinent descriptions apparently was the ground for ATTEMS' decision (1898, 1937) to synonymize *Anoplodesmus striolatus* Pocock with *A. luctuosus* (Peters), and *A. splendidus* (Verhoeff) with *A. anthracinus* Pocock, without much of a discussion. For mere geographical reasons, of course, it is improbable that a species from South Tenasserim is identical with one from Ceylon, or a species from South India with one from Burma, even when the descriptions upon comparison fail to give distinctive characters. Such premature acts of synonymizing only add to the confusion.

In view of the above it may be useful to give here a brief account of the known species of *Anoplodesmus*.

From South India the following species have been described:

Anoplodesmus tanjoricus (Pocock)

- 1892 *Leptodesmus tanjoricus* Pocock, J. Bombay nat. Hist. Soc. 7 : 147, pl. 1 fig. 3—3b. (1)
1932 *Anoplodesmus tanjoricus*; Carl, Rev. Suisse Zool. 39 : 460, fig. 55—57. (2)
1936 *Anoplodesmus tanjoricus*; Attems, Mem. Ind. Mus. 11 : 206. (3)
1937 *Anoplodesmus tanjoricus*; Attems, Tierreich 68 : 100, fig. 128—129.
Distribution. — India : Tanjore (1, 3), Coimbatore (2), Trivandrum (3).

Anoplodesmus splendidus (Verhoeff)

- 1936 *Jonespeltis splendidus* Verhoeff, Rec. Ind. Mus. 38 : 115, pl. 7 fig. 18—19.
Distribution. — India: Kovalam.

Anoplodesmus insignis Attems

- 1936 *Anoplodesmus insignis* Attems, Mem. Ind. Mus. 11 : 207, fig. 33b—33c. (1)
1937 *Anoplodesmus insignis*; Attems, Tierreich 68 : 101, fig. 130.
Distribution. — India : Courtallam (1).

These three species are extremely closely related, and, as far as descriptions go, it is impossible to find reliable points of difference.

The gonopods, which have a more erect telopodite than those of the Ceylon species, apparently lack diagnostic features.

As regards the presence and development of the femoral processes of the 4th to 7th legs of the male, data are vague and sometimes contradictory. For *tanjoricus*, Pocock described femoral prominences in the 5th, 6th and 7th legs. Attems (1936), however, in his description of this species, which was based partly on topotypical material, stated the presence of these processes in the 4th to 7th legs, and made this a distinctive character in respect of his *insignis*, in which processes occurred in the 5th to 7th legs.

Carl (1932) studied material from two localities, from Coimbatore and from "India" without nearer indication, which he referred to *tanjoricus*. In these two series he observed differences in the development of the femoral processes, which, however, were not illustrated and therefore cannot be evaluated.

On comparison of the various descriptions of *tanjoricus*, *splendidus* and *insignis* further differences seem to exist in the outline of the lateral keels, in the development of the pleural keels, and in the shape of the process of the sternite of the 5th somite of the male. But as none of these characters have been illustrated it is not possible to estimate their significance. On the other hand, these discrepancies in the descriptions, vague as they may be, preclude from synonymizing the three species, and only a re-examination of the types and other material can solve the problem of how many species, or subspecies, are actually involved.

The following species have been described from Ceylon:

Anoplodesmus luctuosus (Peters)

- 1864 *Polydesmus (Oxyurus) luctuosus* Peters, Monatsber. k. Akad. Wiss. Berlin 1864 : 532. (1)
 1898 *Anoplodesmus luctuosus* ; Attems, Denkschr. k. Akad. Wiss., math.-naturw. Cl., 67 : 348, pl. 5 fig. 106.
 1937 *Anoplodesmus luctuosus* ; Attems, Tierreich 68 : 104, fig. 134.
 Distribution. — Ceylon : Rambodde. (1)

Anoplodesmus saussurii (Humbert)

- 1865 *Polydesmus Saussurii* Humbert, Mém. Soc. phys. Hist. nat. Genève 18 : 26, pl. 2 fig. 8—8e. (1)
 1898 *Prionopeltis Saussurei* ; Attems, Denkschr. k. Akad. Wiss., math.-naturw. Cl., 67 : 354, pl. 5 fig. 103—104. (2)
 1902 *Prionopeltis Saussurei* ; Carl, Rev. Suisse Zool. 10 : 593. (3)
 1922 *Prionopeltis Saussurei* ; Carl, Zool. Jahrb. (Syst.) 44 : 566. (4)
 1930 *Anoplodesmus attemsii* Verhoeff, Zool. Anz. 89 : 206. (5)
 1936 *Prionopeltis saussurei* ; Verhoeff, Rec. Ind. Mus. 38 : pl. 7 fig. 16—17.
 1936 *Anoplodesmus saussurei* ; Attems, Mem. Ind. Mus. 11 : 207, fig. 33a.
 1937 *Anoplodesmus saussurei* ; Attems, Tierreich 68 : 102, fig. 131—133. (6)
 1937 *Anoplodesmus saussurei* ; Verhoeff, Zool. Anz. 120 : 317. (7)
 Distribution. — Ceylon : Peradeniya (1, 2, 3, 4, 7), Kandy (2, 5), Paradise (6).

Anoplodesmus thwaitesii (Humbert)

- 1865 *Polydesmus Thwaitesii* Humbert, Mém. Soc. phys. Hist. nat. Genève 18 : 27, pl. 2 fig. 9—9b. (1)
 1892 *Leptodesmus thwaitesii* ; Pocock, J. Bombay nat. Hist. Soc. 7 : 147. (2)
 1902 *Prionopeltis Thwaitesii* (sic) ; Carl, Rev. Suisse Zool. 10 : 593. (3)
 1937 *Anoplodesmus thwaitesii* ; Attems, Tierreich 68 : 103.
 Distribution. — Ceylon : Peradeniya (1).

Anoplodesmus humberti (Carl)

- 1902 *Prionopeltis Humberti* Carl, Rev. Suisse Zool. 10 : 590. (1)
 1937 *Anoplodesmus humberti* ; Attems, Tierreich 68 : 103.
 Distribution. — Ceylon : Peradeniya. (1)

The gonopods of these four species have the telopodite more rounded, which distinguishes them well from those of the Indian mainland forms. To what extent they may serve for discriminating the Ceylon species as against each other cannot be decided on the basis of the published drawings. Moreover, the gonopods of *thwaitesii* and *humberti* have not yet been illustrated.

ATTEMs (1898) studied the types of *luctuosus*. As regards the presence or absence of the femoral processes of the legs of the male he made no definite statement, but, as he brought *A. striolatus* Pocock into the synonymy of *luctuosus*, and as *striolatus* lacks these processes, one may assume that they are missing also in *luctuosus*.

It is not clear if HUMBERT's types of *saussurii* were ever re-examined. They do

not seem to be in the Geneva Museum, otherwise CARL (1902) would have mentioned this. ATTEMS (1898) redescribed the species after material from the type locality in the Vienna Museum, but whether or not this included also HUMBERT's types is not clear.

Although *saussurii* has been recorded frequently, and should be the best known species of the genus, the available descriptions and drawings are not yet entirely satisfactory. According to VERHOEFF (1937), *saussurii* shows a certain sexual dimorphism in that the females have the metatergites granulose-subcoriaceous instead of almost smooth as in the males. For that reason he brought his *attemsii*, which was based on a female, into the synonymy of *saussurii*. Other authors, however, have not confirmed this dimorphism.

The name of this species has been consequently misspelled as *saussurei* instead of *saussurii*.

A. thwaitesii appears to have a characteristic colour pattern and is distinct from *saussurii* in having only the 7th leg of the male provided with a ventral femoral process, whereas *saussurii* has a similar modification in the 6th leg also. *A. thwaitesii* differs from *saussurii* also in size and in the outline of the lateral keels.

A. humberti appears very closely related to *saussurii*. It is said to differ in the sculpture of the metatergites, smaller size, the outline of the lateral keels, and in the presence of a ventral prominence in the femur of the 5th leg of the male, but as these characters have not been illustrated they are difficult to evaluate.

Several species, probably pertaining to *Anoplodesmus*, have been described from Ceylon in addition to the four mentioned above. As they have been based on female specimens or even on juveniles their recognition is practically impossible without the study of material from the type localities.

Anoplodesmus layardi (Humbert)

1865 *Polydesmus Layardi* Humbert, Mém. Soc. phys. Hist. nat. Genève 18 : 28, pl. 3 fig. 10—10b.

Distribution. — Ceylon : Peradeniya.

Anoplodesmus inornatus (Humbert)

1865 *Polydesmus inornatus* Humbert, Mém. Soc. phys. Hist. nat. Genève 18 : 30, pl. 3 fig. 11—11c. (1)

1892 *Leptodesmus inornatus* ; Pocock, J. Bombay nat. Hist. Soc. 7 : 147. (2)

Distribution. — Ceylon : Peradeniya (1), Pundaloya (2).

Anoplodesmus sabulosus Attems

1898 *Anoplodesmus sabulosus* Attems, Denkschr. k. Akad. Wiss., math.-naturw. Cl. 67 : 351.

Distribution. — Ceylon : Kandy.

From Mauritius VERHOEFF described the following subspecies of *saussurii*.

Anoplodesmus saussurii (Humbert) subsp. mauritanus Verhoeff

1939 *Anoplodesmus saussurei mauritanus* Verhoeff, Jena. Zeitschr. Naturw. 73 : 66, fig. 39.
Distribution. — Mauritius.

VERHOEFF distinguished this subspecies from *saussurii* by slight differences in the apical portion of the gonopod telopodite. Probably, however, these were caused by a slightly different position of the gonopod, and the subspecific name is better discarded. Obviously *saussurii* has been introduced into Mauritius by human agency.

From the Eastern area of the genus the following species have been described:

Anoplodesmus anthracinus Pocock

See below.

Anoplodesmus striolatus Pocock

1895 *Anoplodesmus striolatus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 799, fig. 6—6a.
Distribution. — Burma : South Tenasserim.

Anoplodesmus pinguis Pocock

See below.

Anoplodesmus obesus Pocock

See below.

Anoplodesmus dyscheres Attems

1898 *Anoplodesmus dyscheres* Attems, Denkschr. k. Akad. Wiss., math.-naturw. Cl., 67 : 349, pl. 5 fig. 102. (1)
1937 *Anoplodesmus dyscheres* ; Attems, Tierreich 68 : 104, fig. 105.
Distribution. — Sumatra : Bindjei (1).

Anoplodesmus kathanus (Chamberlin)

1921 *Prionopeltis kathanus* Chamberlin, Ann. Mag. nat. Hist. (9) 7 : 80. (1)
1937 *Anoplodesmus kathanus* ; Attems, Tierreich 68 : 106.
Distribution. — Burma : Katha (1).

In the gonopods of these species we can also distinguish between a more erect telopodite and a more rounded telopodite. The erect type is found only in *anthracinus*, and this species indeed appears to be quite closely related to the three species occurring in South India: *A. tanjoricus*, *A. splendidus* and *A. insignis*.

The other four species have a more strongly curved gonopod telopodite, and they may be more closely related to the group of species occurring in Ceylon. The Ceylonese species, however, differ by having a deeper incision between the solenophore and the secondary lamina of the tibiotarsus.

A. striolatus was brought into the synonymy of *luctuosus* by ATTEMS, but aside from the difference in the gonopods mentioned above, it is a much smaller species — width 5.0 mm against 7.0 mm for *luctuosus*.

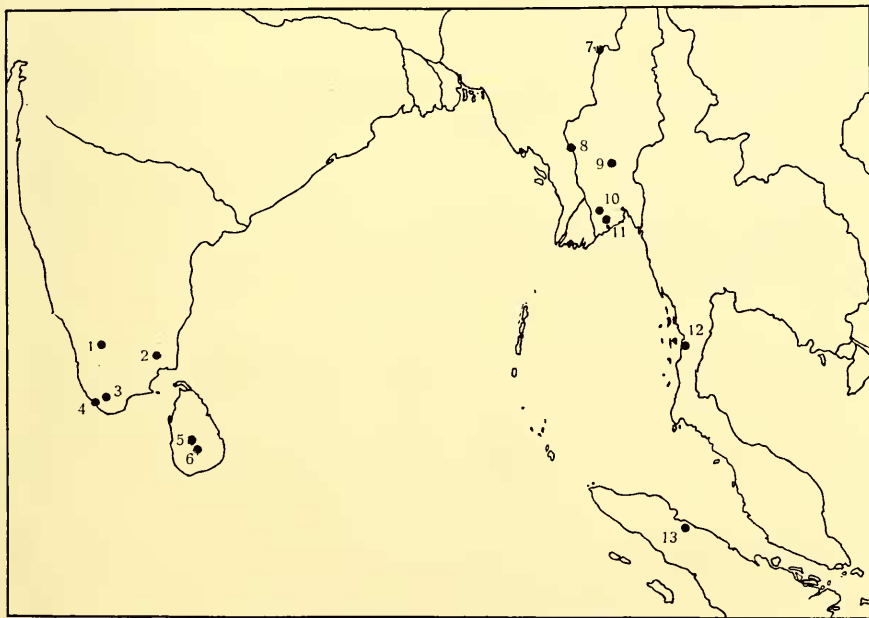
A. dyscheres must be very closely related to *striolatus*, and both species should be re-examined to determine the differential characters.

A. kathanus also needs to be re-examined before anything can be said on its relationship. ATTEMS (1937) considered it perhaps most closely related to *luctuosus*. Because of what CHAMBERLIN wrote of the sternal process of the 5th somite I presume that it may come nearest to *anthracinus*.

Of the species which ATTEMS (1937) referred to *Anoplodesmus* there remain *A. indus* (Chamberlin, 1920), *A. atopus* (Chamberlin, 1920), which, however, do not belong to *Anoplodesmus* but to *Chondromorpha* Silvestri, 1897, and *A. spectabilis* (Karsch, 1881).

The identity of *spectabilis*, however, is totally obscure. If we may trust the gonopod drawing by KARSCH it does not belong to *Anoplodesmus* at all.

The area of *Anoplodesmus* as it is known today corresponds with a well-known discontinuous pattern: Ceylon and Southern India versus tropical East Asia. As it is probably the first definitely established example of this pattern in Diplopoda, I give here a map of the region showing the localities where the species of the genus have been collected.



Map showing the localities from which the species of *Anoplodesmus* have been described or recorded. — 1. Coimbatore (*tanjoricus*). 2. Tanjore (*tanjoricus*, type). 3. Courtallam (*insignis*, type). 4. Trivandrum (*tanjoricus*), Kovalam (*splendidus*, type). 5. Kandy (*saussurii*; *sabulosus*, type), Peradeniya (*saussurii*, type; *thwaitesii*, type; *humberti*, type; *layardi*, type; *inornatus*, type). 6. Rambodde (*luctuosus*, type), Pundaloya Valley (*thwaitesii*; *inornatus*). 7. Katha (*kathanus*, type). 8. Minhla (*anthracinus*). 9. Meteleo (*obesus*, type), Puepoli (*obesus*). 10. Palon (*pinguis*). 11. Rangoon (*anthracinus*, type, *pinguis*, type). 12. South Tenasserim (*striolatus*, type). 13. Bindjei (*dyscheres*, type)

KEY TO THE SPECIES OF *Anoplodesmus*

Excluded are *A. layardi* (Humb.), *A. inornatus* (Humb.), *A. sabulosus* Att., and *A. katbanus* (Chamb.).

1. Species from Burma and Sumatra 2
- Species from India and Ceylon 5
2. Male with femoral prominences in the (4th) 5th to 7th legs. Gonopod telopodite weakly curved, the secondary branch of the tibiotarsus pointing mainly distad. Width 4 to 5 mm. *A. anthracinus* Poc.
- Legs of male without femoral prominences. Gonopod telopodite more strongly curved, the secondary branch of the tibiotarsus pointing mainly caudad. Width 5 to 6.5 mm 3
3. Lateral keels of most somites with the posterior border about transverse on the axis of the body *A. striolatus* Poc., *A. dyscheres* Att.
- Lateral keels of most somites with the posterior border directed obliquely forward 4
4. Posterior edges of keels rounded *A. obesus* Poc.
- Posterior edges of keels more pronounced *A. pinguis* Poc.
5. Male with femoral prominences in the (4th) 5th to 7th, 6th and 7th, or only in the 7th legs 6
- Legs of male without femoral prominences *A. luctuosus* (Pet.)
6. Femoral prominences only in the 7th leg. Width 8 mm. Colour brown with the margins of the lateral keels and the metatergites yellow; moreover, the metatergites have two transverse rows of six to eight yellow spots *A. thwaitesii* (Humb.)
- Femoral prominences in the 6th and 7th, or in the (4th) 5th to 7th legs. Width 4 to 7 mm. Colour different 7
7. Femoral prominences present only in the 6th and 7th legs *A. saussurii* (Humb.)
- Femoral prominences present in the (4th) 5th to 7th legs 8
8. Metatergites with a transverse row of eight to ten tubercles along the posterior margin and a similar row of six tubercles in front of the transverse furrow. Gonopod telopodite rather strongly curved *A. humberti* (Carl)
- Metatergites smooth or somewhat rugulose. Gonopod telopodite weakly curved 9
9. Sternal process of the 5th somite of the male broadly rounded and directed obliquely backward *A. insignis* Att.
- Sternal process of the 5th somite directed downward... *A. tanjoricus* (Poc.), *A. splendidus* (Verh.)

Anoplodesmus anthracinus Pocock

- 1895 *Anoplodesmus anthracinus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 798, fig. 5.
 1898 *Anoplodesmus anthracinus* ; Attems, Denkschr. k. Akad. Wiss., math.-naturw. Cl., 67 : 349, pl. 5 fig. 113—114.
 1937 *Anoplodesmus anthracinus* ; Attems, Tierreich 68 : 99, fig. 127 (excl. synonymy).

Material.

This species was based on an unrecorded number of specimens from Rangoon collected partly by OATES, partly by FEA. Apparently this type material is now spread over several museums. The specimen to be designated as lectotype must be in the British Museum. According to WEIDNER (1960) the Hamburg Museum has six paratypes.

The description published by ATTEMS in 1898, and the drawing published by that author in 1898 and 1937 were based on material from Rangoon in the Hamburg Museum. It seems likely that this was, in fact, the paratypical series mentioned by WEIDNER. Possibly, therefore, some material of the type series is in the Vienna Museum. At least ATTEMS may have retained a gonopod slide of the Hamburg material, like he used to do.

In the Genoa Museum there are now only four specimens of *anthracinus* from Rangoon, XII.1886, viz. 1 ♂ and 3 ♀. I have designated these as paratypes.

In the loan register of the Genoa Museum I found the evidence that SILVESTRI in 1902 borrowed two specimens which apparently were never returned. Probably, these are still in the SILVESTRI collection at Portici.

In addition to the typical material mentioned above, the Genoa Museum has a male specimen from Minhla, 1887, leg. G. B. COMOTTO. This specimen was not seen by POCKOCK, but was stored under the in litteris name "*Strongylosoma dissentaneum* Silvestri".

Description.

Colour. — See POCKOCK. The specimen from Minhla has lost its colour almost entirely.

Width. — ♂ : paratype 4.2 mm, ♂ from Minhla: 4.2 mm. ♀ : 4.8 mm, 3.9 mm, 3.9 mm.

Head and antennae. — Labrum widely and rather deeply emarginate, tridentate. Clypeus weakly convex, scarcely impressed towards the labrum; the lateral border widely rounded, weakly emarginate above the labrum. Headplate smooth and shiny, sparsely hairy up to the frontal region, the vertex hairless. Antennal sockets separated by somewhat less than one and one third of the diameter of a socket, or by slightly more than four fifths of the length of the 2nd antennomere. Post-antennal groove widely and rather deeply concave; the wall in front moderately prominent. Vertex rather weakly convex; the sulcus moderately impressed, running downward to halfway between the antennal sockets. Antennae of moderate length, rather stout, scarcely clavate. Pubescence sparse in the proximal antennomeres to rather dense in the distal ones. Length of antennomeres: $2 = 3 > 4 = 5 > 6$; the 6th antennomere six sevenths of the length of the 2nd.

Collum. — (fig. 9). Distinctly wider than the head. Anterior border faintly convex, faintly concave at the base of the lateral keels; the lateral margin of the keels widely rounded towards the posterior edge. Posterior border widely emarginate, laterally straight, an obtusely rounded edge at the base of the lateral keels; the posterior border of the lateral keels widely emarginate. Latero-posterior edge very narrowly rounded, about right-angled. Surface shiny, polished, hairless, transversely evenly convex, the lateral keels slightly raised, although still rather

strongly declined. Marginal rim laterally rather broad, the premarginal furrow fading away towards the middle of the anterior border.

Somites. — Constriction rather weak. Prosomites polished. Stricture very narrow, not demarcated from the prosomites, dorsally finely beaded, laterally faintly striate down to the level of the stigmata. Metatergites smooth, polished, hairless. Transverse furrow present from the 5th to the 17th somite, weakly impressed, without sculpture. Sides smooth or a little rugulose; granulose up to the 5th somite. Pleural keels represented by distinct ridges in the 2nd and 3rd somites. In the 4th somite a rounded raised lappet, scarcely produced posteriorly. In the 5th somite a rounded, well developed ridge, dorsally demarcated by a furrow which curves upwards and runs parallel to the caudal margin of the somite towards the base of the lateral keel. In the following somites the pleural ridges disappear gradually; the furrow remains visible up to about the 12th somite.

Lateral keels. — (fig. 9—11). The 2nd somite scarcely wider than the collum, about as wide as the 3rd. The 4th somite a little narrower than the 3rd. Keels of the 2nd somite rather strongly declined. The anterior border widely convex, slightly thrust forward, a little shouldered at the base. Latero-anterior edge rather widely rounded, obtuse-angled. Lateral border widely rounded. Posterior border faintly convex, a little curved forward near the base of the keel. Latero-posterior edge narrowly rounded, about right-angled, produced a little caudad and projecting very slightly. Marginal rim rather broad, distinctly demarcated. Keels of the 3rd somite a little less declined than those of the 2nd, the anterior border shouldered at the base, but otherwise directed obliquely caudad. Posterior border practically straight. Latero-posterior edge narrowly rounded, very slightly acute-angled. The marginal rim thicker than in the 2nd somite. Keels of the 4th somite similar to those of the 3rd, but the latero-anterior angle more obtuse. Keels of the 5th and subsequent somites with the anterior margins a little shouldered at the base. The latero-anterior border widely, more or less evenly rounded, without distinct latero-anterior edge. Posterior edges rather narrowly rounded, obtuse-angled up to the 13th somite and in the 15th somite, the angle becoming a little acute in the 14th, 16th, and subsequent somites. From the 16th somite onwards the posterior edges project a little behind the posterior margin of the somites. Keels of the 5th somite a little declined, those of the 6th and following somites horizontal. Marginal rim dorsoventrally rather thick; the pores lateral in a distinct, oval concavity.

Sternites and legs. — Sternites of middle somites as long as wide. Cross impressions indistinct. The transverse furrow widely interrupted in the middle, distinct only between the coxal bases. Instead of a longitudinal furrow a wide and moderately deep excavation. Pubescence moderate, the hairs short. Sternite of the 5th somite normal between the posterior legs. Between the anterior legs a swelling, with on the middle a transverse ridge of about two thirds of the width between the coxae, rather thick, rounded, slightly emarginate in the middle. Pubescence normal. Sternite of the 6th somite caudally very slightly excavate, otherwise normal. Sternites of the 7th and 8th somites without particulars. Legs (fig. 12—13) rather long, stout. Pubescence moderate ventrally, absent dorsally, except in the distal podomeres. The two ultimate pairs distinctly shorter than the preceding ones, but not modified. Anterior legs more incrassate. The femora of the 5th and 6th legs

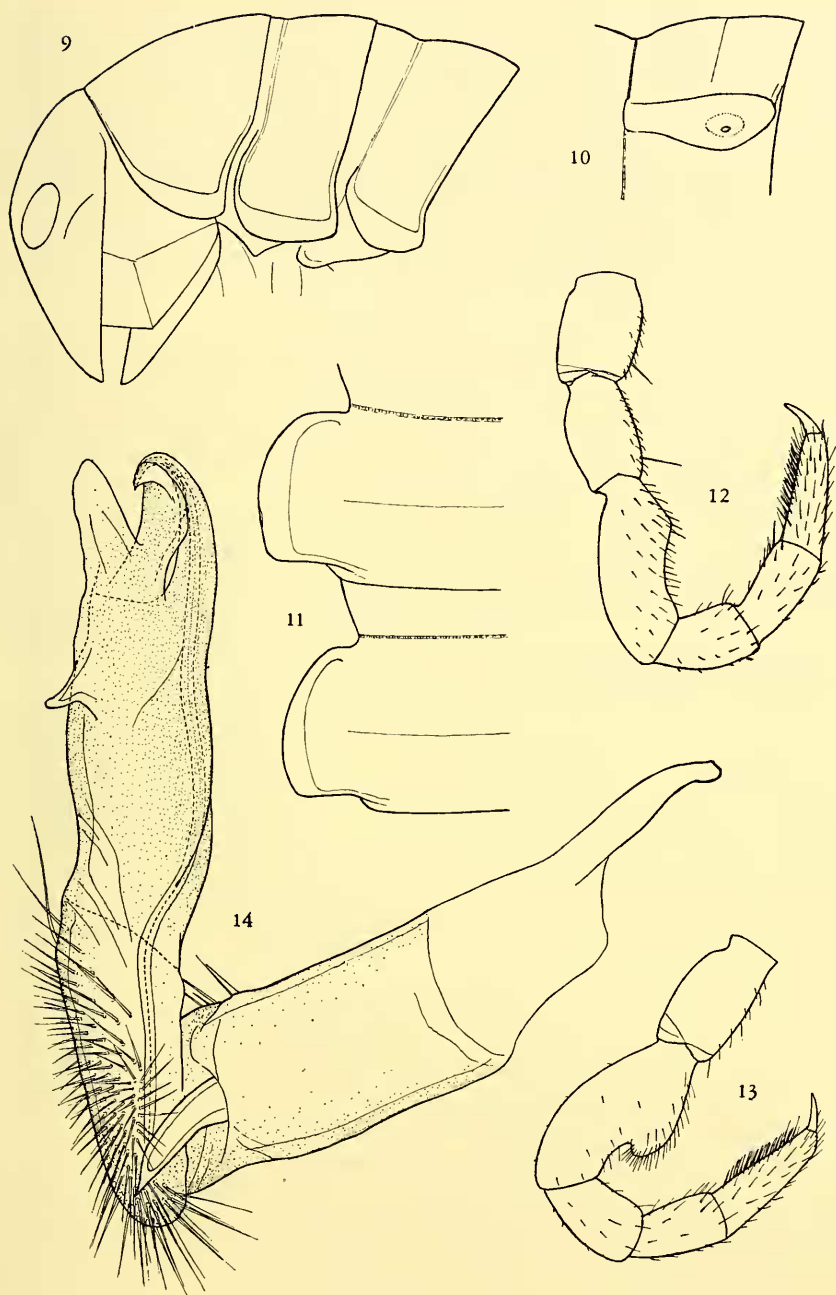


Fig. 9—14. *Anoplodesmus anthracinus* Pocock, paratype ♂. — 9: left side of the head, collum and the 2nd and 3rd somites, lateral aspect. 10: left side of the 10th somite, lateral aspect. 11: left side of the 10th and 11th somites, dorsal aspect. 12: 2nd leg of the 5th somite. 13: telopodite of the 2nd leg of the 6th somite. 14: right gonopod, mesal aspect

with a ventral conical swelling, of the 7th leg with a rounded process. Brushes of tibiae and tarsi present in the anterior legs but not conspicuously thick, thinning out in the postgonopodial legs and absent in the 2nd half of the body. Length of podomeres: $3 > 6 > 5 = 2 > 4$; the 6th podomere three fifths of the 3rd.

Anal somite. — Epiproct long, narrow, parallel-sided or even faintly constricted near the base. The end rounded, truncate, without terminal knobs. Ventral side convex. Basal and distal setiferous tubercles minute. Valves a little rugulose. The rims of moderate height and width. Setiferous tubercles large but low. Hypoproct subtriangular to almost evenly rounded, broad. The setiferous tubercles weakly developed, not projecting behind the border.

Gonopods. — (fig. 14). Coxa straight, of moderate width and length, with some latero-distal hairs. Coxal horn with a slender distal projection. Prefemur elongate, in one line with the axis of the acropodite, laterally distinctly, obliquely demarcated from the femur. Femur stout, slightly curved mesad. No postfemoral region demarcated. At the end, arising from the medio-posterior side, a small acuminate (post)femoral process directed mesad and a little proximad. Tibio-tarsus laterally distinctly demarcated from the femoral region, consisting of a solenophorous part and a simple secondary lamella. The solenophore curving slightly mesad, the secondary lamella directed distad and a little mesad. Spermal channel running almost straight along the anterior side of the femur. Solenomerite stout, arising from the anterior side of the distal end of the femur, supported but not actually sheathed by the solenophore.

Female. — Differentiated from the male by the following characters, aside from the usual sexual ones. Antennal sockets separated by nine tenths of the length of the 2nd antennomere. Antennae relatively shorter, the 6th antennomere scarcely shorter than the 2nd. Body a little more robust, with the keels slightly less developed. 2nd, 3rd and 4th somites each somewhat wider than the preceding somites. Length of the sternites of the middle somites a little over four fifths of the width. Legs comparatively a little shorter, moderately slender. Length of podomeres: $3 > 6 > 2 > 5 = 4$. Epiproct relatively shorter, the sides slightly convergent.

Remarks.

According to Pocock, this species has the femora of the legs of the 5th and 6th somites provided with inferior thickenings. In the material studied the anterior legs of the 5th somite definitely lack this modification. Attems (1898) mentions only the process on the femora of the posterior legs of the 6th somite.

Either Pocock had more than one species before him, or *anthracinus* is variable as regards the development of the femoral modifications, or Pocock may have been in error. The first two alternatives seem somewhat improbable to me, but only the examination of the lectotype can solve this problem. Attems probably overlooked the smaller processes of the posterior legs of the 5th, and the anterior legs of the 6th somite.

Among the species of *Anoplodesmus* occurring in Burma, Malaya and Sumatra, *anthracinus* stands rather isolated, although the enigmatic *A. kathanus* (Chamb.) may eventually prove to be closely related.

A clear relationship, however, exists with the species described from South India, namely *A. tanjoricus* (Poc.), *A. splendidus* (Verh.) and *A. insignis* Att. According to Pocock, *anthracinus* may be distinguished from *tanjoricus* "by its fuscous legs and sternal areas, much less prominent keels and deeper transverse tergal sulcus". *A. insignis* also appears to have more strongly developed lateral keels, and the process of the sternite of the 5th somite is described as a "broad, designated as lectotype and paratype respectively.

A. splendidus was brought into the synonymy of *anthracinus* by Attems (1937), but the description by Verhoeff is too short to judge the correctness of this action.

Anoplodesmus obesus Pocock

1895 *Anoplodesmus obesus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34: 800.

1895 *Anoplodesmus pinguis* ♂ Pocock, l.c.: 800, fig. 7—7a.

1937 *Anoplodesmus obesus* + *Anoplodesmus pinguis* ♂; Attems, Tierreich 68: 105.

Material.

This species was based on an unrecorded number of specimens of both sexes from Meteleo. The Genoa Museum has a male and a female, which I have designated as holotype and paratype respectively.

Moreover, the male specimen from Puepoli which Pocock referred to *A. pinguis* is not conspecific with the female lectotype of that species, but belongs to *obesus*.

Meteleo, Carin Cheba, coll. L. FEA, 1 ♂ lectotype, 1 ♂ paratype. Puepoli, Carin Cheba, coll. L. FEA, 1 ♂.

Description.

Colour. — See Pocock.

Width. — ♂: lectotype: 6.0 mm; paratype of *pinguis*: 5.7 mm. ♀: 5.6 mm.

Head and antennae. — Antennal sockets separated by one and a half times the diameter of a socket, or by four fifths of the length of the 2nd antennomere. Postantennal groove wide and shallow, the wall in front weakly prominent. Pubescence of antennae moderate in the basal antennomeres to dense in the distal ones. Length of antennomeres: $2 = 3 = 4 > 5 > 6$; the 6th antennomere four fifths of the length of the 2nd.

Collum. — Distinctly wider than the head. The anterior border straight in the middle, laterally widely and almost evenly rounded towards the latero-posterior edge. Posterior border faintly emarginate or practically straight in the middle, widely convex laterally. A notch at the base of the lateral keels. Posterior border of keels faintly convex or straight. Latero-posterior edge of keels slightly obtuse-angled, very narrowly rounded. Surface of collum smooth and rather shiny in the middle, rugulose on the lateral keels.

Somites. — Constriction very weak. Prosomites rather shiny. Stricture narrow, sculpture as in *anthracinus*. Metatergites smooth and rather shiny, coriaceous on the lateral keels. Transverse furrow present from the 5th to the 18th somite, weak also in the 4th somite. Sides coriaceous and minutely granular. Pleural keels

represented by distinct ridges in the 2nd to 4th somites, produced caudally in a triangular lappet, which projects scarcely behind the posterior border only in the 2nd somite, not in the 3rd and 4th somites. The lappet is slightly acute-angled in the 2nd and 3rd somites, obtusely angular in the 4th. Pleural keels in the 5th and subsequent somites represented by a well developed, rounded swelling, dorsally demarcated by a furrow which caudally curves upward along the posterior margin. The furrow is present up to the 15th somite, and is faintly indicated in the 16th and 17th somites.

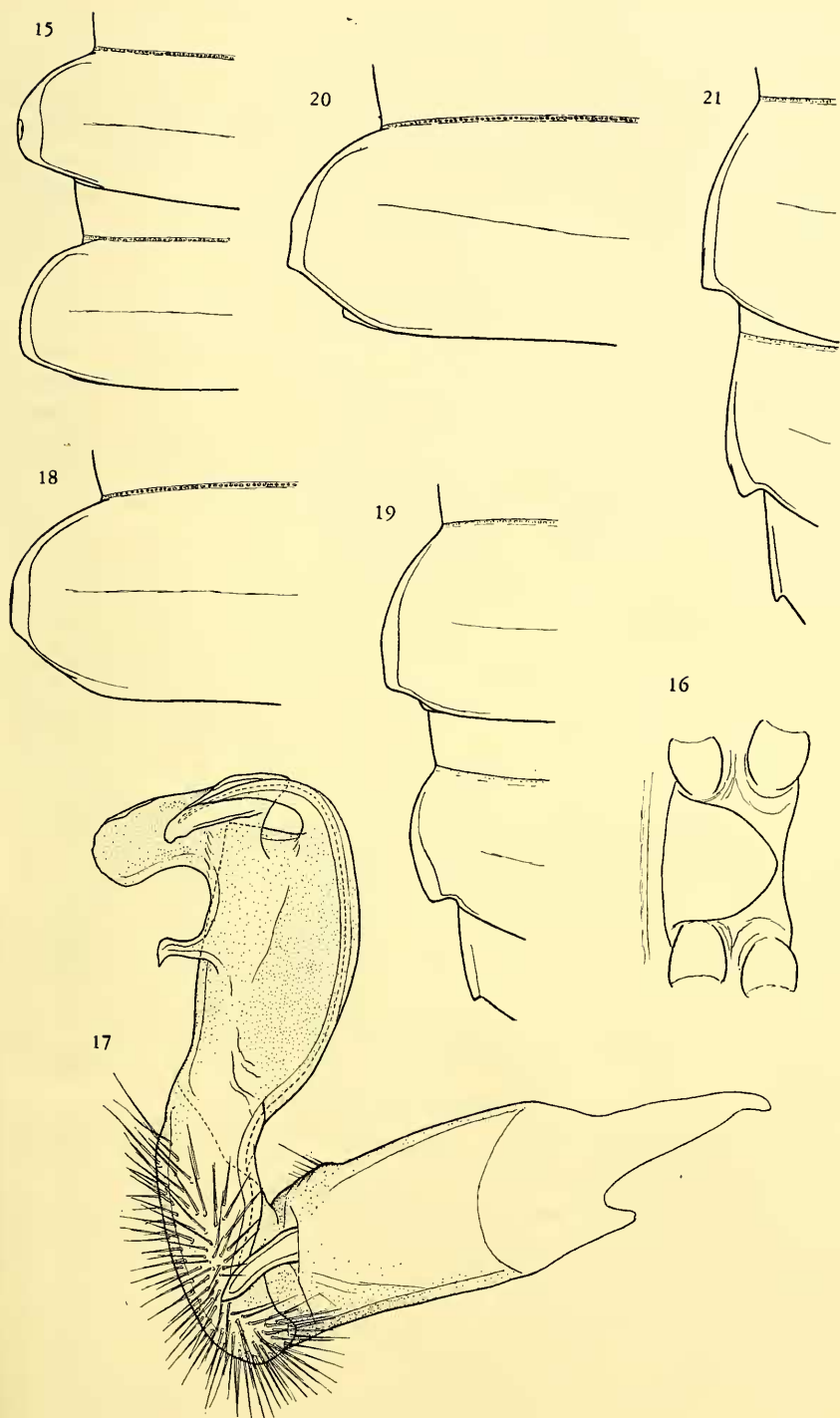
Lateral keels. — (fig. 15). The 2nd, 3rd, and 4th somites about as wide as the collum. Keels of the 2nd somite a little declined. The anterior border scarcely shouldered at the base, widely rounded, more strongly rounded towards the lateral side and shading off into the lateral border, which is straight. Anterior border practically transverse on the longitudinal axis of the body. Posterior border as in *anthracinus*, scarcely curved forwards basally. Latero-posterior edge obtuse-angled, narrowly rounded, projecting a little caudad of the posterior border of the somite. Keels of the 3rd somite with the anterior border widely rounded, directed obliquely caudad; no latero-anterior edge, but the latero-anterior border rather widely, obtusely rounded. Posterior border a little concave basally, laterally obtusely and rather widely rounded, without latero-posterior edge. Keels of the 4th somite similar to those of the 3rd, both are projecting a little behind the border of the somites. Keels of the 5th and subsequent somites slightly declined as in the preceding somites. Anterior borders not shouldered. The anterior borders widely to very widely rounded. Latero-posterior edges obtuse-angled up to the 16th somite, right-angled in the 17th, acute-angled and slightly projecting in the 18th and 19th somites. Marginal rim rather thick, in the poriferous keels widening in the area of the pore, becoming about two times as wide as the poreless keels.

Sternites and legs. — Cross impressions of the sternites with the longitudinal furrow scarcely impressed, the transverse furrow distinct. Sternite of the 5th somite with a very thick process between the anterior legs (fig. 16), which curves caudad, covering also a part of the posterior half of the sternite. It has a sub-pentagonal shape. Posterior part of the sternite of the 5th somite somewhat concave. Sternite of the 6th somite without particulars between the anterior legs, the posterior part a little excavate. Sternite of the 7th somite with a weak transverse ridge laterad of the anterior margin. Sternite of the 8th somite without particulars. Legs rather long, moderately slender, somewhat incrassate in the anterior part of the body, but without modifications. Last legs not modified.

Anal somite. — Epiproct with the sides nearly parallel.

Gonopods. — (fig. 17). Coxal horn without slender projection. Prefemur a little less elongate than in *anthracinus*. Femur more strongly rounded, widening

Fig. 15—19. *Anoplodesmus obesus* Pocock. — 15: left side of the 10th and 11th somites, dorsal aspect, lectotype ♂. 16: sternite of the 5th somite, ventral aspect, lectotype ♂. 17: right gonopod, mesal aspect, lectotype ♂. 18: left side of the 10th somite, dorsal aspect, paratype ♀. 19: left side of the 17th, 18th and 19th somites, dorsal aspect, paratype ♀. Fig. 20—21. *Anoplodesmus pinguis* Pocock, lectotype ♀. — 20: left side of the 10th somite, dorsal aspect. 21: left side of the 17th, 18th and 19th somites, dorsal aspect



distad. Both parts of the tibiotarsus pointing meso-caudad, relatively larger than in *anthracinus*.

Female. — Differentiated from the male, aside from the usual sexual characters, as follows. Antennal sockets separated by about the length of the 2nd antennomere. Antennae relatively a little shorter. Body a little more robust, with the lateral keels somewhat less developed (fig. 18—19). The 2nd somite a little wider than the collum. The 3rd and 4th somites of about the same width as the 2nd. Sternites as long as wide. Legs relatively somewhat shorter, slightly more slender. Length of podomeres: $3 > 6 > 2 > 5 = 4$; the 6th podomere about half the length of the 3rd. Epiproct relatively shorter, the sides weakly convergent.

In the characters not mentioned *obesus* agrees with *anthracinus*.

Remarks.

After close comparison of the lectotype ♂ of *obesus* with the male specimen from Puepoli referred to *A. pinguis* by Pocock, there remains no doubt whatever that these two specimens are conspecific. In fact, it is difficult to see why Pocock referred the Puepoli specimen to *pinguis*, for the alleged differences in the shape of lateral keels are totally insignificant and do not correspond with the differences between the females of *obesus* and *pinguis*.

A. obesus belongs in a group with *A. pinguis* Poc., *A. striolatus* Poc., and *A. dyscheres* Att. It appears to come closest to *A. pinguis* of which, unfortunately, the male is still unknown. *A. striolatus* and *A. dyscheres* both differ from *obesus* in the shape of the lateral keels, which have the posterior border transverse on the axis of the body instead of running obliquely cephalad. Undoubtedly, more characters will be found when these two species are re-examined.

Anoplodesmus pinguis Pocock

1895 *Anoplodesmus pinguis* ♀ Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 800.

1937 *Anoplodesmus pinguis* ♀; Attems, Tierreich 68 : 105.

Material.

This species was based on two female specimens from Rangoon, one collected by OATES, one by FEA, and several immature specimens from Palon in Pegu collected by FEA.

The Genoa Museum has one female specimen from Rangoon, which I have designated as lectotype, and a single juvenile female from Palon, now labelled as paratype.

WEIDNER (1960) quotes a single paratype from Palon in the Hamburg Museum, obviously one of the juveniles mentioned by Pocock. The specimen collected by OATES is probably located in the British Museum.

The male specimen from Puepoli certainly does not belong to *pinguis* as was suggested by Pocock, but proves to be conspecific with *obesus*.

Description.

Colour. — See Pocock.

Width. — ♀ : 6.4 mm; juvenile ♀ with 19 segments: 4.1 mm.

Head and antennae. — Antennal sockets separated by one and two fifths times the diameter of a socket or by seven eighths of the length of the 2nd antennomere.

Collum. — Lateral margin without distinct latero-posterior edge.

Lateral keels. — (fig. 20—21). The latero-anterior and latero-posterior edges of the keels of the 2nd somite slightly more widely rounded than in *obesus*. The latero-posterior edges of the keels in the second half of the body distinctly angular; the edges right-angled in the 17th somite, acutely angular in the 18th and 19th somites. All the lateral keels are smaller than in *obesus*.

Sternites. — In the middle somites the sternites are somewhat broader than long.

In the characters not mentioned, *pinguis* agrees with the paratype female of *obesus*.

In the juvenile female the keels are relatively somewhat more strongly developed than in the adult. As usually the reverse is the case, one may wonder if this juvenile does not belong to an other species.

Remarks.

As the male which POCOCK tentatively referred to this species does not belong to *pinguis* but to *obesus*, the male characters of *pinguis* are unknown. Yet, *pinguis* is undoubtedly closely related to *obesus*, and we may safely assume that the gonopods will prove to be largely similar to those of *obesus*, and that anyhow the differential characters are to be found mainly in the external morphology, particularly in the shape of the lateral keels.

Trogodesmus Pocock

1895 *Trogodesmus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 804.

1937 *Kronopolites* in part; Attems, Tierreich 68 : 49.

1963 *Attemsina* Hoffman, Ann. Mag. nat. Hist. (13) 5 : 585.

Type-species.

Trogodesmus: *Trogodesmus bicolor* Pocock, 1895, by subsequent designation by SILVESTRI, 1896 (Ann. Mus. civ. Stor. nat. Genova 36 : 197).

Attemsina: *Kronopolites uncinatus* Attems, 1936, by original designation.

Diagnosis.

When he established this genus, POCOCK characterized *Trogodesmus* in the following way: "Resembles *Strongylosoma* in the majority of its characters, but differs markedly in the unusual development of the two tubercles upon the anal sternite".

At the time, the name *Strongylosoma* embraced a vast and heterogeneous majority of the known Paradoxosomatidae of the world, and this, together with the nature of the used character, made the diagnosis quite unsatisfactory from the very beginning. Moreover, the three species of *Trogodesmus* were based on female specimens, and it is therefore no wonder that the genus was foredoomed to fall into oblivion.

While studying the type material of two species of *Trogodesmus* in the Genoa Museum, I realized that they presented a combination of characters which is quite singular in the family Paradoxosomatidae. After a confrontation of this material with the descriptions of the paradoxosomatids subsequently described from Burma and adjacent regions, it became evident that the two species of *Trogodesmus* were

extremely similar to *Kronopolites uncinatus* Attems from Assam, and *Kronopolites helvolus* Attems from Burma.

As a rule a generic identification without the aid of male characters is questionable in this family. However, it becomes less so when the general morphology of the species involved is sufficiently characteristic as in the present case, and the postulation is supported by a geographical argument. I feel, therefore, perfectly safe to refer *uncinatus* and *helvolus* to *Trogodesmus* and to supplement the generic diagnosis with the male characters of these two species.

20 somites; poreformula normal. Head without particulars. Antennae of moderate length. Collum somewhat wider than the head.

Somites moderately (♂) to weakly (♀) constricted; stricture narrow. Metatergites with a rather coarse leathery sculpture; a deep transverse furrow from the 4th or 5th somite onwards. Pleural keels weakly developed and present only up to the 4th somite, or absent (?).

Lateral keels rather weakly developed; those of the 2nd somite somewhat below the level of those of the 3rd. Posterior edges of keels projecting behind the margin of the somites in the 2nd somite only or in the 2nd and a few posterior somites. Margin of keels entire, without indentations.

Sternites in the middle part of the body about as long as wide (♂, ♀) or somewhat broader than long (♀); no sternal cones. Sternite of the 5th somite of the male without process. Legs of moderate length. Brushes on tarsi present or absent. First leg of male not modified.

Gonopod coxa moderately developed. Prefemur short, ovoid. Femur slender, elongate, straight. Spermal channel running straight along the mesal side of the femur. No postfemoral region demarcated. Solenomerite arising from the mesal side of the distal end of the femur. Tibiotarsus springing from the lateral side of the distal end of the femur, slender, straight in line with the axis of the femur. Solenomerite sheathed or at least supported by the tibiotarsus.

Remarks.

In the Genoa Museum I found only the type material of *Trogodesmus vittatus* Poc. and *T. nigrescens* Poc. The two type specimens of *T. bicolor* Poc. mentioned by POCOCK were sent out on loan to SILVESTRI many years ago; they may still be in the SILVESTRI collection at Portici.

Although I thus could not re-examine the type-species of *Trogodesmus*, the three species described by POCOCK appear to be so similar that their congenerity seems beyond doubt.

As was stated above, I consider two species previously referred to *Kronopolites* Att., viz., *K. uncinatus* Att. and *K. helvolus* Att. congeneric with the species of *Trogodesmus* on account of their external similarity. These two species have nothing to do with the type-species of *Kronopolites*, and actually were removed from that genus recently by HOFFMAN (1963). HOFFMAN quite correctly created a new genus, *Attemsina*, for the two, but unfortunately I have to bring this name into the synonymy of *Trogodesmus*.

The genus *Trogodesmus* thus consists of the following species:

Trogodesmus bicolor Pocock, 1895 (Ann. Mus. civ. Stor. nat. Genova 34 : 804, fig. 10—10a) — Burma.

Trogodesmus vittatus Pocock, 1895 — Burma.

Trogodesmus nigrescens Pocock, 1895 — Burma.

Trogodesmus uncinatus (Attems, 1936) (Mem. Ind. Mus. 11 : 230, fig. 47; 1937, Tierreich 68 : 55, fig. 68—69) — Assam.

Trogodesmus helvolus (Attems, 1936) (Mem. Ind. Mus. 11 : 231, fig. 48; 1937, Tierreich 68 : 56, fig. 70—71) — Burma.

Owing to the circumstance that the male characters are known only for two out of five species, the distinction between the species of *Trogodesmus* is almost impossible. Therefore, the following key perforce is very defective.

Key to the species of *Trogodesmus*

1. Width (♀) 6.0 mm. Dorsum with a broad, continuous and parallel-sided yellow stripe. Hypoproct with a convex posterior border; the elongate tubercles projecting considerably *T. bicolor* Poc.
- Width (♂, ♀) 4.0 to 4.9 mm 2
2. Dorsum with a broad median yellowish band or series of spots 3
- Dorsum without yellow band or spots 4
3. A large yellow spot on the metatergites. Keels of the 17th somite right-angled, of the 18th and 19th somites acute-angled, not projecting behind the posterior margin (♀). Hypoproct with the posterior border obtuse-angled, rounded; tubercles mammiform, projecting behind the margin, but not reaching beyond the middle *T. vittatus* Poc.
- Dorsum with a continuous yellow band. Keels of the 16th and 17th somites right-angled, of the 18th and 19th acute-angled, scarcely projecting behind the margin (♂). Hypoproct rounded (tubercles ?) *T. helvolus* (Att.)
4. Dorsal surface a uniform chocolate brown. Keels of the 16th somite right-angled, of the 17th to 19th acute-angled, those of the 18th and 19th somites projecting a little behind the posterior border (♀). Hypoproct with the posterior border obtusely angular, rounded; the tubercles somewhat bifid, projecting behind the middle *T. nigrescens* Poc.
- Colour pale brown. Keels from the 13th to the 15th somite angular, those of the 16th to 19th a short blunt tooth (♂). Hypoproct with the posterior border straight, with two large tubercles *T. uncinatus* (Att.)

Trogodesmus vittatus Pocock

1895 *Trogodesmus vittatus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 806.

Material.

This species was based on a single female specimen which I studied in the Genoa Museum: Palon (Pega), coll. L. FEA, 1 ♀ holotype.

Description.

Colour. — See POCOCK.

Width. — 4.4 mm.

Head and antennae. — Labrum tridentate, the emargination deep and moderately wide. Clypeus moderately convex, rather strongly impressed towards the labrum; the lateral border straight, a distinct notch near the labrum. Headplate rugulose

in the clypeal part, otherwise smooth. Pubescence rather dense to moderate up to the lower part of the vertex. Vertex hairless. Antennal sockets separated by the diameter of a socket, or by a little more than two thirds of the length of the 2nd antennomere. Postantennal groove widely and rather deeply impressed; the wall in front moderately prominent. Vertex moderately convex, demarcated from the frontal region by a weak transverse depression. Vertigial sulcus well impressed, running downward to the upper level of the antennal sockets. Antennae of moderate length, moderately stout, distinctly clavate. Pubescence moderate in the proximal antennomeres to dense in the distal ones. Length of antennomeres: $2 = 3 > 4 > 5 = 6$; the 6th antennomere about four fifths of the length of the 2nd.

Collum. — (fig. 22). A little wider than the head, subtrapezoidal in dorsal outline. Anterior border straight in the middle, evenly rounded towards the lateral border. Posterior border widely emarginate in the middle, faintly convex laterally, and practically straight at the side. Lateral border rather widely and practically symmetrically rounded. Surface minutely rugulose-subgranulose, hairless. Marginal rim laterally very narrow and weakly defined. Collum transversely almost evenly convex, the lateral sides scarcely raised.

Somites. — Robust and weakly constricted. Prosomites dull, somewhat silky. Stricture narrow, anteriorly sharply demarcated from the prosomite, dorsally finely but distinctly ribbed down to the level of the lateral keels, faintly striate below. Metatergites minutely but rather coarsely leathery rugulose, hairless. Transverse furrow well impressed, finely striolate, present in the 4th to 18th somites, weak also in the 19th. Sides minutely but densely granulate. Pleural keels of the 2nd and 3rd somites represented by well developed ridges, which are scarcely produced caudad. The posterior edge in the 3rd somite is about right-angled. In the 4th somite the pleural ridge is less defined and caudally rounded. From the 5th somite onwards the pleural keels are missing.

Lateral keels. — (fig. 22—24). 2nd, 3rd and 4th somites each slightly wider than the preceding somite. Keels of the 2nd somite with the anterior border faintly convex, slightly thrust forward. Latero-anterior edge slightly acute-angled. Lateral border widely convex. Latero-posterior border rather narrowly rounded, without distinct edge, projecting somewhat behind the margin of the somite. Marginal rim narrow, laterally weakly demarcated. Keels of the 3rd somite semi-elliptical in outline, anteriorly and posteriorly evenly rounded, without edges. Marginal rim thin as in the 2nd somite, but more distinctly demarcated. The lateral margin faintly undulate. Keels of the 4th somite similar to those of the 3rd, but the anterior border a little more widely rounded, and the keel a little broader caudally. Keels of the 5th and subsequent somites with the latero-anterior border becoming more and more widely rounded. Posterior edges weakly defined, very obtuse, except in the 17th somite, where right-angled, and in the 18th and 19th somites, where acutely angular. In none of these somites the edges project behind the margin of the somites. Poreless keels only dorsally demarcated, the poriferous keels also ventrally demarcated by a furrow in the posterior half. Pores lateral in a small ovoid excavation.

Sternites and legs. — Sternites in the middle part of the body as long as wide.

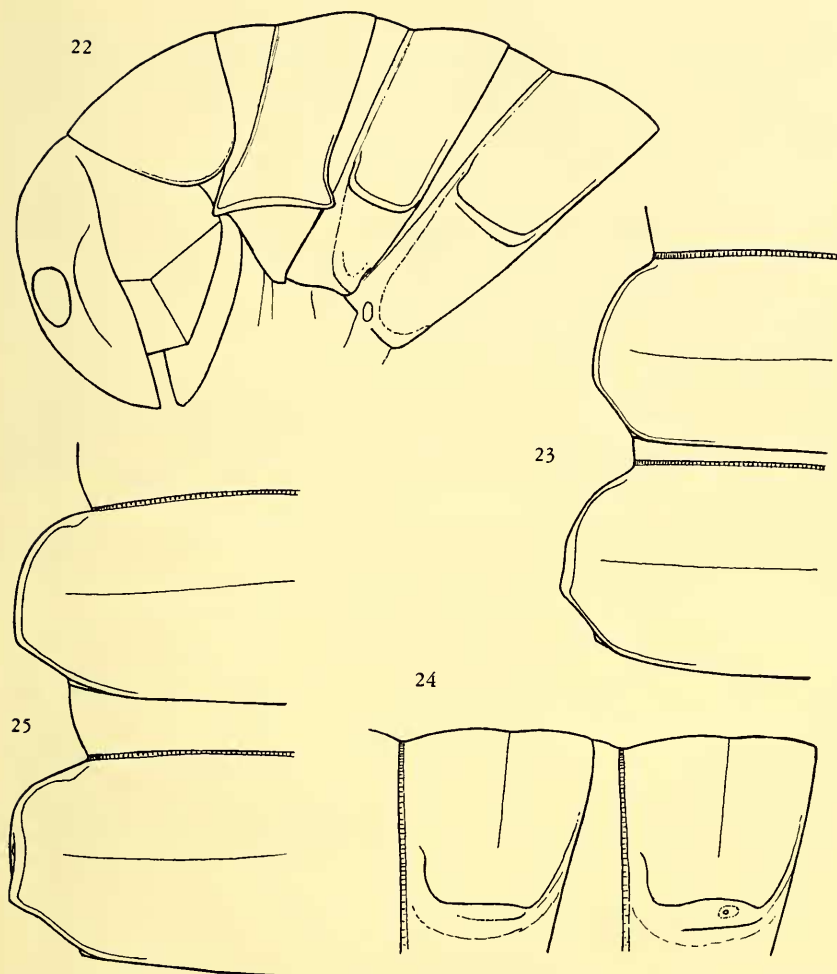


Fig. 22—24. *Trogodesmus vittatus* Pocock, holotype ♀. — 22: left side of head and four anterior somites, lateral aspect. 23: left side of the 11th and 12th somites, dorsal aspect. 24: left side of the 11th and 12th somites, lateral aspect. Fig. 25. *Trogodesmus nigrescens* Pocock, holotype ♀. — left side of the 11th and 12th somites, dorsal aspect

Cross impressions moderately developed; the transverse furrow distinct, deepest; the longitudinal furrow weaker. No sternal cones. Pubescence moderate to sparse. Legs of moderate length, moderately slender. Pubescence ventrally moderate, dorsally sparse becoming moderately dense in the tarsi only. Length of podomeres: $3 > 6 > 5 = 2 > 4$; the 6th podomere almost two thirds of the length of the 3rd.

Anal somite. — Epiproct of moderate size; the sides converging concavely, becoming parallel near the end. Basal setiferous tubercles distinct; preterminal setiferous tubercles also well developed. Epiproct produced into two well developed cones which are moderately widely separated and directed a little ventrad. Valves

somewhat rugulose. The marginal rims narrow but rather high. Setiferous tubercles large. Hypoproct triangular-subtrapezoidal; the sides practically straight, the posterior border with a very obtuse-angled rounded median edge. Setiferous tubercles very large, mammiform, protruding past the margin but not projecting beyond the middle of the posterior border.

Remarks.

Under the name of *Trogodesmus vittatus* Pocock the Genoa Museum has also three juvenile specimens from Palon. Obviously these are the juveniles POCKOCK (l.c.: 805) referred to *T. bicolor* Pocock. The material consists of a 19-segmented ♂, width 2.7 mm, and two 19-segmented ♀, width 3.0 mm, and 3.1 mm. They lack a distinct longitudinal flavous band and their reference to one of the two mentioned species is purely arbitrary.

T. vittatus in colouring apparently suggests *T. helvolus* (Att.) from Lashio, Burma. But the middorsal band of yellowish colour is broken into a large spot on each metatergite, instead of being continuous as seems to be the case in *helvolus*. For the rest, ATTEM'S description of *helvolus* does not contain reliable characters for separating it from *vittatus*.

T. bicolor Poc. also has a yellow middorsal band which is continuous and parallel-sided. Moreover, *bicolor* is a larger species.

Trogodesmus nigrescens Pocock

1895 *Trogodesmus nigrescens* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 806.

Material.

The single female specimen on which this species was based has been re-examined in the Genoa Museum: Carin Cheba, Bia Po, 400—900 m, coll. L. FEA, 1 ♀, holotype.

Description.

Colour. — See POCKOCK.

Width. — 4.9 mm.

Head and antennae. — As in *vittatus*.

Collum. — In general as in *vittatus*, but the lateral marginal rim more distinct. The lateral lappets more raised than in *vittatus*, but still declined.

Somites. — Metatergites more shiny than in *vittatus*, similarly rugulose but coarsely so only on the upper surface of the lateral keels. Pleural keels as in *vittatus*, those of the 2nd and 3rd somites produced into a distinct right-angled lappet, not projecting caudad of the margin of the somite.

Lateral keels. — (fig. 25). Relatively a little more strongly developed than in *vittatus*. Keels of the 2nd somite with the latero-anterior edge distinctly toothed, and the posterior edge obtusely rounded. The marginal rim well demarcated. Keels of the 3rd somite with the anterior border thrust forward a little and with a weakly defined obtusely rounded posterior edge. Keels of the 4th somite anteriorly faintly shouldered at the base. Keels of the 5th to 8th somites anteriorly a little shouldered at the base. The posterior edge right-angled in the 16th somite, acute-angled from the 17th somite onwards. From the 16th somite onwards the edges are slightly

produced caudad, in the 18th and 19th somites they project very slightly beyond the posterior margin.

Sternites and legs. — Sternites of the middle somites almost one and one fifth times broader than long. Pubescence rather dense, in the anterior sternites dense. Pubescence of legs in general a little more strongly developed than in *vittatus*. Length of podomeres: $3 > 6 > 2 > 5 = 4$; the 6th podomere about half as long as the 3rd.

Anal somite. — Epiproct as in *vittatus*, but the terminal cones at least two times longer than in *vittatus*, and directed obliquely ventrad. Hypoproct as in *vittatus*, but the setiferous tubercles bifid, more elongate and projecting behind the middle.

Remarks.

This species differs from *bicolor*, *vittatus* and *helvolus* in the absence of a yellow median band. From *T. uncinatus* it seems to differ in the development of the lateral keels, in which the posterior edges appear to be more pronounced. Perhaps there is a difference in the hypoproct too, but the description of *uncinatus* is too vague for a satisfactory comparison.

The Oriental Paradoxosomatidae characterized by the presence of a femoral tubercle in the first pair of legs of the male

The next two genera, *Tetracentrosternus* Poc. and *Pocockina* gen. nov., belong to the group of Indo-Australian Paradoxosomatidae in which the femur of the first legs of the male has a ventral tubercle. This group includes all the known Australian Paradoxosomatidae, with the possible exception of *Mjoebegodesmus* Verhoeff, 1924. Furthermore, it has some genera in the Papuan region, viz., *Aschistodesmus* Pocock, 1898, *Dendrogonopus* Jeekel, 1964, and possibly *Haplochiropus* Attems, 1944, as well as the following genera in the Oriental region. Some of these genera have not yet been established, and the giving of names is deferred until actual examination of pertinent material.

Unnamed genus

"*Strongylosoma*" *montigena* Carl, 1935 (Rev. Suisse Zool. 42 : 330, fig. 9—14; ATTEMs, 1937, Tierreich 68 : 255, fig. 317) — Sikkim.

Unnamed genus

"*Orthomorpha*" *hingstoni* Carl, 1935 (Rev. Suisse Zool. 42 : 326, fig. 1—6; ATTEMs, 1937, Tierreich 68 : 230, fig. 289) — Tibet.

"*Orthomorpha*" *simulans* Carl, 1935 (Rev. Suisse Zool. 42 : 330, fig. 7—8; ATTEMs, 1937, Tierreich 68 : 231) — Nepal, Tibet.

Delarthrum Attems, 1936 (Mem. Ind. Mus. 11 : 236)

Delarthrum obscurum Attems, 1936 (l.c. : 236, fig. 50, 1937, Tierreich 68 : 246, fig. 307) — Northern Pakistan.

Pocockina gen. nov., cf. p. 134

Pocockina pilifera (Pocock, 1895) — Burma.

Yuennanina Attems, 1936 (Mem. Ind. Mus. 11 : 234)

Yuennanina ceratogaster Attems, 1936 (l.c. : 234, fig. 49 ; 1937, Tierreich 68 : 259, fig. 323—324) — Yunnan.

Tetracentrosternus Pocock, cf. p. 129*Tetracentrosternus subspinosus* Pocock, 1895 — Burma.*Xiphidiogonus* Carl, 1932 (Rev. Suisse Zool. 39 : 444)*Xiphidiogonus spinipleurus* Carl, 1932 (l.c. : 444, fig. 31—34; ATTEMS, 1937, Tierreich 68 : 247, fig. 308) — Peninsular India.*Xiphidiogonus dravidus* Carl, 1932 (l.c. : 447, fig. 35—39; ATTEMS, 1937, Tierreich 68 : 248, fig. 309) — Peninsular India.*Xiphidiogonus bendersoni* Carl, 1932 (l.c. : 449, fig. 40—43; ATTEMS, 1937, Tierreich 68 : 248, fig. 310) — Peninsular India.

Unnamed genus

"Polydrepanum" implicatum Carl, 1941 (Rev. Suisse Zool. 48 : 371, fig. 23—25) — Peninsular India.

The taxonomic importance of the presence of a femoral tubercle in the first pair of legs of the male is difficult to evaluate in these eight genera.

In the Paradoxosomatidae of Australia and New Guinea the character largely correlates with the gonopod structure. Unfortunately this is not the case in the above eight genera. The presence of the femoral tubercle does not coincide with any particular structure of the gonopods.

Nevertheless, it seems justified to regard the character as an indication of a certain amount of relationship between the genera involved, even though it has no decisive value.

Two of the above mentioned genera, *Xiphidiogonus* and a genus to be erected for "*Polydrepanum*" *implicatum* Carl, have a femoral tubercle also in the 2nd pair of legs. By evidence of the gonopods and in view of the geographical coherence these two appear to be most closely related to a number of South Indian genera which have the modification only in the 2nd pair of legs, viz., *Polydrepanum* Carl, 1932, *Telodrepanum* Carl, 1932, and *Grammorhabdus* Carl, 1932, as well as *Gyrodrepanum* Carl, 1932, a genus which lacks femoral tubercles in both anterior pairs of legs.

Recently (1964) I removed "*Strongylosoma*" *montigena* Carl from the genus *Akamptogonus* Att., to which it had been referred by ATTEMS (1937). The species certainly represents a generic type which appears to stand quite isolated even among the group which has the femoral tubercle in the first leg of the male.

The genus to be proposed for "*Orthomorpha*" *hingstoni* Carl and "*O.*" *simulans* Carl is characterized by a peculiar small process arising from the lateral side of the gonopod femur. The two species were referred to the genus *Alogolykus* Attems, 1936, by ATTEMS (1937), but, as HOFFMAN (1963) pointed out, they have nothing to do with that genus. The two species may come nearest to *Delarthrum* Att., but the relationship is by no means obvious.

The remaining four genera will be discussed under the remarks on *Tetracentrosternus* and *Pocockina*.

Key to the paradoxosomatid genera of the Oriental region characterized by the presence of a ventral femoral tubercle in the first pair of legs of the male

1. Gonopods with an entirely free solenomerite, which is longer and stouter than the other processes of the acropodite, and is not acuminate towards the end. The 2nd pair of legs of the male without a femoral process. Legs of the 4th to 8th pairs with a basal swelling on the ventral side of the femur. Pleural keels absent Unnamed genus ("*Strongylosoma*" *montigena* Carl)
- Gonopods with a slender, acuminate solenomerite supported or sheathed by the tibiotarsus, and not exceeding the tibiotarsus in length 2
2. The 2nd pair of legs of the male without femoral process 3
- The 2nd pair of legs of the male with a femoral process similar to the one occurring on the first leg 7
3. Acropodite of the gonopods deeply split into several processes; the femoral part less than half the length of the acropodite 4
- Acropodite not deeply split; the femoral part exceeding half the length of the acropodite 5
4. Sternite of the 5th somite of the male with a long anterior and a short posterior process. Sternite of the 6th somite with a large process. Solenomerite of the gonopods with two accessory branches. Pleural keels absent ... *Yuennanina* Att.
- Sternite of the 5th somite of the male with only the usual anterior process. Sternite of 6th somite without process. Solenomerite without accessory branches. Pleural keels present in a number of anterior somites ... *Tetracentrosternus* Poc.
5. Prefemur of gonopods with a small finger-like process arising from the lateral side. Pleural keels absent ... Unnamed genus ("*Orthomorpha*" *kingstoni* Carl, "*Orthomorpha*" *simulans* Carl)
- Prefemur of gonopods without process. Pleural keels present 6
6. Tibiotarsus well demarcated from the femur of the gonopods, subarticulate. Gonopod femur with a small distal process *Delarthrum* Att.
- Tibiotarsus not sharply demarcated from the gonopod femur. The femur with a process exceeding half the length of the tibiotarsus *Pocockina* nov. gen.
7. Acropodite of the gonopods split to the middle of the femur, from where arise a large and a small femoral process Unnamed genus ("*Polydrepanum*" *implicatum* Carl)
- Acropodite of the gonopods not deeply split. The femoral processes small ... *Xiphidiogonus* Carl

Tetracentrosternus Pocock

1895 *Tetracentrosternus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 802.

1963 *Tetracentrosternus* ; Hoffman, Ann. Mag. nat. Hist. (13) 5 : 589.

Type-species.

Tetracentrosternus subspinosus Pocock, 1895, by monotypy.

Diagnosis.

20 somites; poreformula normal. Head without particulars. Antennae long, a little clavate. Collum a little narrower than the head, transversely furrowed.

Somites moderately constricted; the stricture of moderate width. Metatergites with a deep transverse furrow present from the 2nd somite onwards. Pleural keels present only in the somites of the anterior half of the body.

Lateral keels moderately developed, those of the 2nd somite below the level of those of the 3rd. Posterior edges of keels produced caudad only in a number of somites in the posterior half of the body. Lateral margin of keels without distinct indentations.

Sternites of the somites of the middle of the body about as long as wide in the male. Sternal cones present in most postgonopodial somites. Sternite of the 5th somite of the male with a well developed process between the anterior legs. Sternite of the 6th somite of the male somewhat modified. Legs rather long. Tibial and tarsal brushes present in most legs of the male. First leg of the male with a ventral femoral tubercle.

Gonopod coxa relatively small. Gonopod prefemur short and broad, laterally well demarcated from the acropodite. Femur completely reduced, the acropodite consisting of three main processes arising directly from the prefemur: a femoral process, a solenomerite and a tibiotarsus. Solenomerite and femoral process elongate and both partly sheathed by folds of the tibiotarsus. Laterad of these two prongs arises the tibiotarsus, which is folded complicatedly and ends in a reflexed lamina.

Remarks.

The type-species of *Tetracentrosternus* has been studied recently by HOFFMAN (1963), who gave a pair of gonopod drawings and discussed the relationship of the genus. Together with *Alogolykus* Attems, 1936, and *Touranella* Attems, 1937, *Tetracentrosternus* was brought into a new tribe Alogolykini, which was characterized mainly by the shortened gonopod femur, the presence of a femoral process in the gonopods, and the absence of a femoral tubercle in the first pair of legs of the male.

As regards the non-gonopod characters of *Tetracentrosternus*, HOFFMAN relied on the description of POCOCK, and consequently overlooked the presence of a femoral tubercle in the first leg of the male of *T. subspinosus*. This does not, however, affect HOFFMAN's discussion of the relationship of *Tetracentrosternus* with *Alogolykus*, since this is mainly based on the undeniable agreement in the gonopod structure. On the other hand, the presence of the femoral tubercle seems to indicate that *Tetracentrosternus* is also related to *Yuennanina* Att., a genus also characterized by an abbreviate gonopod femur, but lacking an elongate femoral process in the gonopods.

Tetracentrosternus subspinosus Pocock

1895 *Tetracentrosternus subspinosus* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 803, fig. 9—9a.

1963 *Tetracentrosternus subspinosus* ; Hoffman, Ann. Mag. nat. Hist. (13) 5 : 591, fig. 9—10.

Material.

This species was originally described after material from Puepoli and Bia Po; the number of specimens was not recorded. Judging from the arrangement of the

description it seems that POCOCK had only male specimens of this species.

In the British Museum there is only one male from Puepoli which has been recently selected as lectotype by HOFFMAN. In the Genoa Museum I found a single male from Bia Po which I have labelled as paratype and on which the following description has been based. In the loan register of the Genoa Museum I found the evidence that one specimen from Puepoli was sent out to SILVESTRI in 1902. This specimen is probably still in the SILVESTRI collection at Portici.

Carin Cheba, Bia Po, 1000—1200 m, coll. L. FEA, 1 ♂ paratype.

Description.

Colour. — See POCOCK.

Width. — 2.0 mm.

Head and antennae. — Labrum deeply and rather widely emarginate, tridentate. Clypeus moderately convex, moderately impressed towards the labrum; the lateral border widely emarginate. Headplate smooth (?); pubescence moderate up to the lower half of the vertex. Antennal sockets separated by one and one third times the diameter of a socket or by three fifths of the length of the 2nd antennomere. Postantennal groove wide, rather deep; the wall in front rather prominent. Vertex weakly convex. The sulcus well impressed, not reaching the upper level of the antennal sockets. Vertex demarcated from the frontal region by a weak depression. Antennae long and rather stout, a little clavate. Pubescence moderate proximally to dense distally. Length of antennomeres: $3 > 4 > 5 > 2 > 6$; the 6th antennomere over three quarters of the length of the 2nd, and over three fifths of the length of the 3rd.

Collum. — A little narrower than the head, subsemicircular in dorsal outline. Anterior border evenly widely rounded, slightly more narrowly rounded laterally. Posterior border faintly concave, widely rounded laterally. Sides widely and a little asymmetrically rounded, the rounding narrowing caudad. Surface shiny, smooth; a deep transverse furrow; some dispersed hairs. Marginal rim laterally narrow but well raised, anteriorly practically obsolete. Convexity of collum weak in the middle, much stronger towards the lateral sides.

Somites. — Prosomites dulled by a fine cellular structure, distinctly marked off from the stricture. Stricture finely ribbed dorsally down to the level of the lateral keels, below that level with some transverse striae. Metatergites shiny, smooth or with some irregular wrinkles. Transverse furrow widely and deeply impressed, finely but distinctly striate, present from the 2nd to the 18th somite, weak also on the 19th. A weak longitudinal median furrow may be visible sometimes. Sides smooth, only in the anterior somites with a few dispersed granules in the lower part. Pleural keels represented by a distinct ridge in the 2nd somite. In the 3rd and 4th somites a rounded lappet projecting outward, in the 4th somite produced caudad a little but not projecting behind the margin of the somite. In the 5th, 6th and 7th somites a lappet projecting outward only above the posterior legs, particularly developed in the 6th somite.

Lateral keels. — (fig. 26—27). 2nd somite a little wider than the collum; 3rd somite narrower than the 2nd; the 4th wider than the 2nd. Keels of the 2nd somite below the level of those of the 3rd somite, sloping a little in a ventro-cephalad direction. Anterior border moderately widely rounded, shouldered a little at the

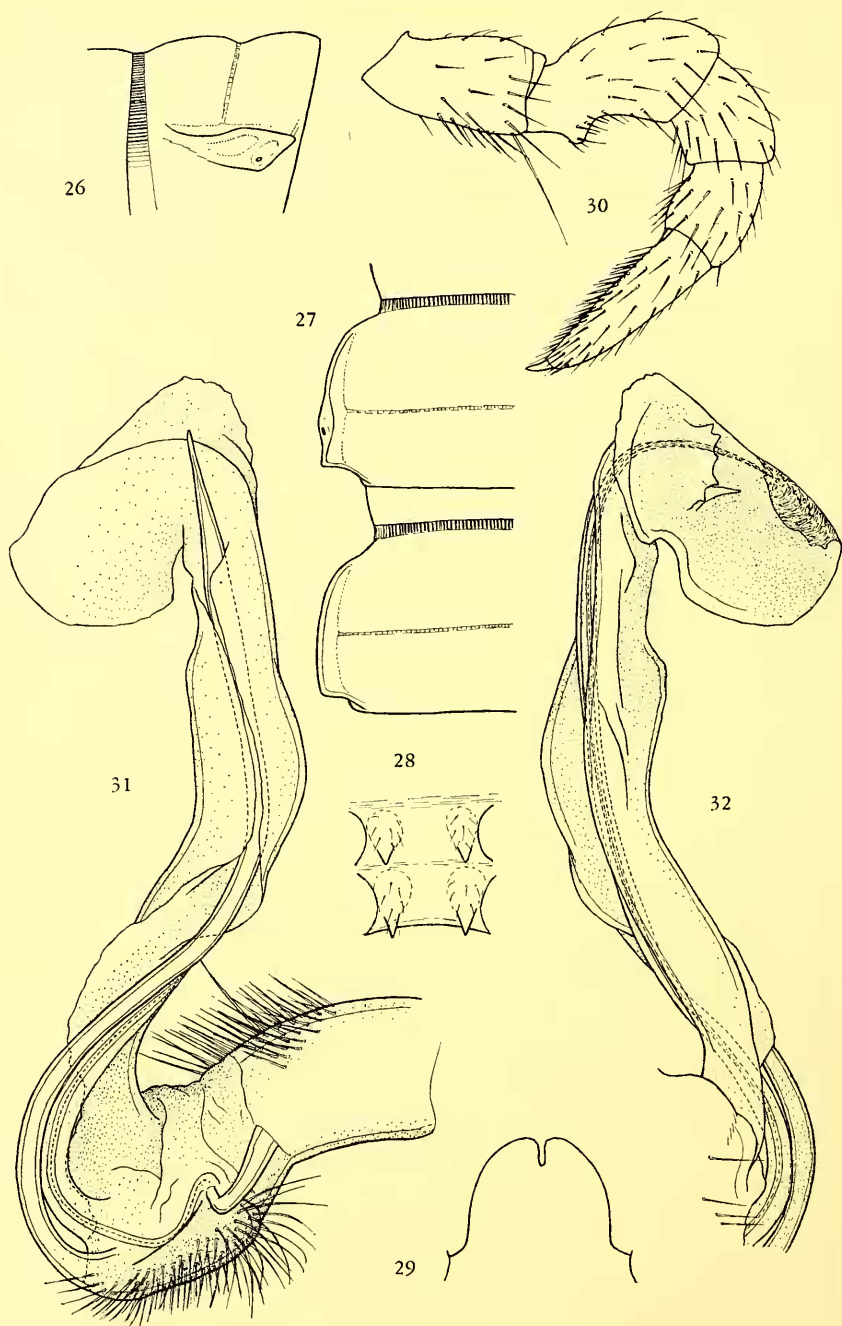


Fig. 26—32. *Tetracentrosternus subspinosus* Pocock, paratype ♂. — 26: left side of the 10th somite, lateral aspect. 27: left side of the 10th and 11th somites, dorsal aspect. 28: sternite of the 16th somite, ventral aspect. 29: sternal process of the 5th somite, caudo-ventral aspect. 30: telopodite of the first leg. 31: right gonopod, mesal aspect. 32: right gonopod, lateral aspect

base. Latero-anterior edge obtusely angular, produced into a small tooth. Lateral border widely rounded, faintly undulate. Posterior border narrow, practically straight. Latero-posterior edge obtuse-angled, produced and projecting very slightly behind the posterior border of the somite. Marginal rim narrow. Keels of the 3rd and 4th somites anteriorly and laterally moderately to widely rounded, with indications of two teeth; the rounding in the 4th somite a little wider. Posterior edges obtuse, narrowly rounded, not produced caudad. Posterior borders faintly convex. Marginal rims narrow. Keels of the 5th and subsequent somites with the anterior and lateral borders widely rounded, without notches. Posterior edges obtusely angular up to the 11th somite, right-angled in the 12th, becoming more acutely angular from the 13th somite onward. From the 13th somite onward the edges are produced a little, the 15th to 19th somites and particular the 17th somite having a small triangular posterior lappet. Only in the 18th and 19th somites the edges project a little behind the posterior margin of the somites. Poriferous keels with the pores in an oblique elliptical excavation. In front of the poriferous excavation a similar more elongate excavation; the two being separated by an oblique ridge. Poreless keels narrow dorso-ventrally, without particulars.

Sternites and legs. — Middle sternites about as long as wide. Cross impressions with the transverse furrow moderately impressed, the longitudinal furrow practically absent; the sternites conspicuously little raised above the level of the ventral side of the somite. Near the coxae a setiferous knob, low in the 8th somite, more strongly developed in the 9th, becoming conical in the 10th and subsequent somites. From the 11th somite onwards the posterior cones are directed backwards, from the 12th somite onwards the anterior cones also. In the subsequent somites the sternal cones become stronger and sharply pointed (fig. 28). In the 18th somite the cones are totally absent. Coxal bases in the 4th somite conspicuously widely separated. Sternite of the 5th somite with a broad, almost semicircular process between the anterior legs, directed a little cephalad. Distal end medially with a narrow, rather deep incision, the anterior side with short setae near the distal end but without brush (fig. 29). Prosomite of the 5th somite a little swollen in front of the process. Transverse furrow weak. Posterior portion of the sternite scarcely raised above the ventral level of the metasomite; pubescence reduced to a pair of tufts. Sternite of the 6th somite deeply excavated, not raised above the ventral surface of the metasomite; pubescence reduced to four tufts of setae. Sternite of the 7th somite without particulars. Legs rather long and moderately slender; the prefemora a little incrassate. Legs of the first pair a little incrassate, with a ventral femoral tubercle (fig. 30). 2nd pair of legs missing in specimen studied. Ventral pubescence of legs rather dense, dense in the prefemora; dorsal pubescence sparse to moderately dense, rather dense in tarsi only. Dense tarsal and distal tibial brushes present in most legs, thinning out in the last third part of the body and absent in the last two pairs. Length of podomeres: $3 > 6 > 5 = 2 > 4$; the 6th podomere seven tenths of the length of the 3rd.

Anal somite. — Epiproct rather broad, rather short, moderately thick. Sides converging a little concavely. Preterminal setiferous tubercles small. The end truncate, slightly emarginate, without distinct terminal knobs (tail damaged a little by the pin running through the body). Valves rugulose, the rims of moderate

width and height; setae not on tubercles. Hypoproct trapezoidal, the sides a little emarginate, the posterior border rounded. No distinct setiferous tubercles.

Gonopods. — (fig. 31—32). Coxa curving a little caudad, with a rather densely setiferous area on the anterior side. Prefemur directed distad, the demarcation between prefemur and acropodite parallel to the longitudinal axis of the latter. Femoral process arising mesad of the base of the solenomerite, curving into the same direction as the tibiotarsus, the distal portion largely sheathed by two folds of the tibiotarsus. The process is a slender style which is finely acuminate towards the end; it remains on the mesal side of the tibiotarsus throughout. Solenomerite also curving in the same direction as the tibiotarsus, the distal part also largely sheathed by folds of the tibiotarsus. The solenomerite is also a slender style, but it runs along the latero-anterior side of the tibiotarsus and bends finally towards the caudal side. Structure of the tibiotarsus very complicated, for the details see the drawings.

Pocockina gen. nov.

Type-species.

Orthomorpha pilifera Pocock, 1895.

Diagnosis.

20 somites; poreformula normal. Head without particulars. Antennae strongly clavate. Collum about as wide as the head.

Somites rather strongly constricted; the stricture rather broad. Metatergites with a deep transverse furrow, present from the 4th somite onwards. Pleural keels weakly developed, present in a few anterior somites only.

Lateral keels well developed, those of the 2nd somite below the level of those of the 3rd. Posterior edges of keels produced caudad and projecting behind the posterior margin in all somites. Lateral margin of keels with two indentations.

Sternites in the middle part of the body slightly longer than wide in the male, broader than long in the female. No sternal cones. Sternite of the 5th somite of the male with a well developed process between the anterior legs. Sternites of the 6th and 8th somites of the male somewhat modified. Legs rather long. Tibial and tarsal brushes present in most legs of the male. First leg of male with a ventral femoral tubercle.

Gonopod coxa well developed. Gonopod prefemur short, ovoid, laterally well demarcated from the femur. Femur slender, elongate. Spermal channel running straight along the medial side of the femur. Distally the femur curves abruptly laterad, and gives rise to a simple, leaf-like femoral process, the solenomerite and the tibiotarsus. Femoral process arising cephalad of the course of the spermal channel. Solenomerite flagelliform, in its natural position probably almost entirely sheathed by the lamellae of the tibiotarsus. Tibiotarsus consisting of a large concave blade, with concavity mesad, subsemicircular in outline, complicated by thin, serrulate lamellae.

Remarks.

When describing *Orthomorpha pilifera*, POCKOCK compared this species with *Orthomorpha coarctata* (Sauss.), which, of course, was quite incorrect.

Like *Tetracentrosternus*, the species belongs to the group of South East Asian paradoxosomatids in which the males have a femoral tubercle in the first pair of legs. It comes nearest to *Delarthrum obscurum* Attems, 1936, from the Abbottabad district in the North of West Pakistan, but seems sufficiently distinct to warrant a generic separation.

The differences between *Delarthrum* Att. and *Pocockina* mainly concern the distal part of the gonopod telopodite. In *Delarthrum* there is a small femoral process arising near the end of the femur on the medial side, cephalad of the course of the spermal channel. This small femoral process in *Delarthrum*, in *Pocockina* apparently is represented by the leaf-like lamella, which, however, arises here just distad of the bend of the femur. In *Delarthrum* the tibiotarsus is sharply demarcated from the femoral section of the gonopod, whereas in *Pocockina* there is no such sharp demarcation. In *Delarthrum*, moreover, the solenomerite arises straight from the distal end of the femur, without the spermal channel first making an abrupt bend in the lateral direction as in *Pocockina*. The structure of the tibiotarsus in *Pocockina* also appears widely different from that in *Delarthrum*.

As to how far external morphology of *Delarthrum* and *Pocockina* presents differences of generic importance is difficult to say at present.

The new genus is named in memory of R. I. POCKOCK.

Pocockina pilifera (Pocock)

1895 *Orthomorpha pilifera* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 809, fig. 11—11a.

Material.

This species was based on material from Rangoon collected by OATES, and from Palon in Pegu collected by FEA. The number of specimens has not been recorded. The British Museum has 1 ♂ and 1 ♀ from Rangoon, of which the first should eventually be designated as lectotype. WIEDNER (1960) quotes one paratype from Palon in the Hamburg Museum.

In the Genoa Museum I examined 1 ♂ and 1 ♀ from Palon, which I have labelled as paratypes and on which the following description is based.

Description.

Colour. — See POCKOCK.

Width. — ♂ : 1.8 mm; ♀ : 2.1 mm.

Head and antennae. — Labrum widely and rather deeply emarginate, tridentate. Clypeus moderately convex, moderately impressed towards the labrum; the lateral border straight, widely emarginate near the labrum. Headplate smooth, shiny, moderately setiferous up to between the antennal sockets, the vertex hairless(?). Antennal sockets separated by one and one third times the diameter of a socket or by amply four fifths of the length of the 2nd antennomere. Postantennal groove wide, moderately deep; the wall in front moderately prominent. Vertex weakly convex; the sulcus rather weakly impressed, not reaching the upper level of the antennal sockets. Antennae of moderate length, moderately stout. Pubescence moderate in the proximal antennomeres to dense in the distal ones. Length of antennomeres:

$2 > 3 > 4 > 5 = 6$; the 6th antennomere three quarters of the length of the 2nd; width of the 6th antennomere equal to five sixths of its length.

Collum. — Subtrapezoidal in dorsal outline; about as wide as the head. Anterior border widely rounded in the middle, a little more narrowly rounded towards the lateral sides and practically straight laterally. Posterior border widely and weakly emarginate, laterally faintly convex. Lateral border widely rounded towards a narrowly rounded posterior lappet which is slightly produced caudad. Surface smooth, shiny; three transverse rows of hairs: one along the anterior margin, one in the middle and one near the posterior margin. Marginal rim of the sides narrow, caudally weakly defined. Convexity of collum weak in the middle, much stronger towards the sides, the lateral sides scarcely raised.

Somites. — Prosomites very dull, but not silky. Stricture distinctly ribbed dorsally to low down the sides. Transverse furrow of metatergites very deeply and widely impressed, coarsely ribbed, present from the 4th to the 18th somite. A weakly impressed median furrow behind the transverse furrow, and generally a weak longitudinal furrow in front of the transverse furrow. A transverse row of four setae behind the stricture and a similar row of generally eight setae near the posterior margin; the hairs of moderate length. Sides coarsely granulate in the anterior somites, coarsely granulate in the lower half only and smooth in the upper half in the subsequent somites. Pleural keels weakly developed. 2nd somite with a coarse ridge produced downward. In the 3rd somite a rather weak ridge, not produced caudad. In the 4th somite a similar, but weaker ridge. 5th and subsequent somites without pleural keels, but with a ridge along the posterior margin from the lateral keels downward curving a little cephalad above the posterior leg. Above the anterior leg a swelling. The ridges and swellings remain visible up to the 17th somite.

Lateral keels. — (fig. 33—34). 2nd, 3rd and 4th somites each slightly wider than the preceding somites. Keels of the 2nd somite somewhat declined. Anterior border widely rounded, a little shouldered at the base. Latero-anterior edge about right-angled, produced laterally into a tooth. Lateral border widely rounded, with two indentations. Posterior border practically straight. Latero-posterior edge slightly acute-angled, not pointed, produced caudad and projecting distinctly behind the posterior margin of the somite. Margin of keels thin, the rim rather distinctly defined. Keels of the 3rd and 4th somites subsimilar. Anterior border widely rounded, lateral border almost straight, with two indentations. Posterior edges very acute-angled, pointed and strongly produced caudad, and projecting behind the margin. Marginal rims moderately thick. Keels of the 5th and subsequent somites with the anterior border rather widely rounded and the lateral border almost straight and with two indentations. The posterior edges acutely angular, in the middle somites somewhat less acute than in the anterior and posterior somites. Pores in an elliptical excavation, and situated just above the second lateral tooth.

Sternites and legs. — Sternites of middle somites one and one eighth longer than broad. Cross impressions with the transverse furrow deepest. Pubescence moderate to rather sparse. Sternite of the 5th somite with a quadrate process between the anterior legs, which is more than one half as wide as the distance between the coxae. The end of the process rather abruptly and strongly curved cephalad,

weakly and widely incised in the middle. Before the end a brush of short hairs in the anterior concavity. Transverse furrow behind the process well impressed. Posterior portion of the sternite triangularly emarginate-excavate. Sternite of the 6th somite deeply excavate, not raised above the level of the ventral side of the metasomite except near the coxal bases. Pubescence reduced to four tufts of setae. Sternite of the 7th somite with a weak ridge latero-cephalad of the gonopod opening. Sternite of the 8th somite somewhat excavate, without distinct longitudinal furrow and with a weak transverse furrow. Legs rather long, moderately stout. The prefemora somewhat incrassate. Anterior legs incrassate, the femur

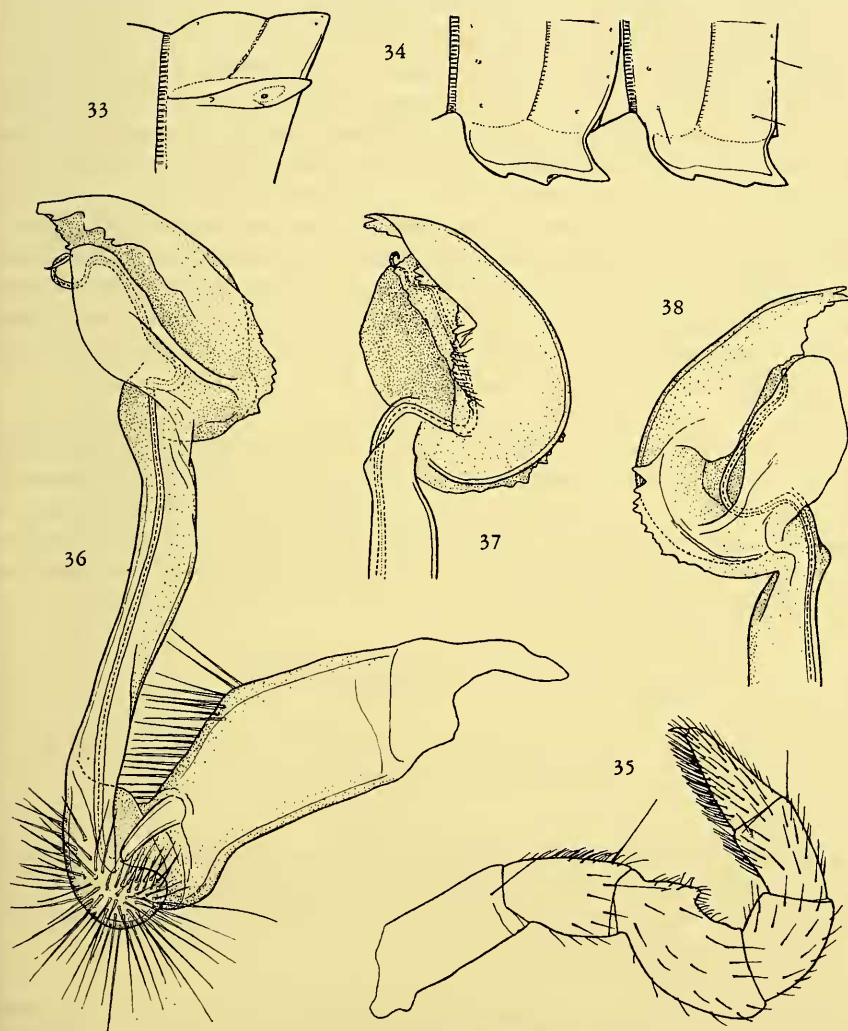


Fig. 33—38. *Pocockina pilifera* (Pocock), paratype ♂. — 33: left side of the 10th somite, lateral aspect. 34: left side of the 10th and 11th somites, dorsal aspect. 35: first leg. 36: right gonopod, mesal aspect. 37: left gonopod apex, anterior aspect. 38: the same, posterior aspect

of the 1st leg with a ventral tubercle (fig. 35). Legs of the 17th, and especially of the 18th somite slightly shortened, and with in particular the 4th and 5th podomeres incrassate. Dorsal pubescence of legs moderate, rather dense only in the tarsi. Ventral pubescence moderate, but dense in the prefemora and rather dense in the femora. Tarsal and distal tibial brushes very dense in the anterior legs, gradually thinning out in the subsequent legs and almost absent in the legs of the 17th somite. No brushes in the legs of the 18th somite. Length of podomeres: $3 > 6 > 5 = 2 > 4$; the 6th podomere nine tenths of the length of the 3rd.

Anal somite. — Epiproct broad, moderately long, the ventral side a little concave. Sides converging concavely, parallel near the end. Preterminal lateral setiferous tubercles small, the other setiferous tubercles also rather inconspicuous. End of epiproct broad, with a pair of rather narrowly separated, large, low, rounded terminal knobs. Valves rugulose; the marginal rims narrow and rather high. Setiferous tubercles weakly developed. Hypoproct triangular-subtrapezoidal. The sides a little concave, the posterior border rounded. Setiferous tubercles minute, not produced.

Gonopods. — (fig. 36—38). Coxa distinctly bent caudad in the distal half, anteriorly setose. Demarcation between prefemur and femur almost transverse on the longitudinal axis of the femur. Tibiotarsus very complicated, the concave lamella with several serrulate laminae. Owing to dirt attached to the concave lamella it was not possible to determine the exact structure of this lamella and the true position and base of the solenomerite.

Female. — Aside from the usual sexual characters differing from the male by the following characters. Antennal sockets separated by slightly more than the diameter of a socket or by three quarters of the length of the 2nd antennomere. Antennae relatively shorter. Pleural keels as in the male, but those of the 4th somite almost absent. Sternites of middle somites one and one quarter times broader than long. Legs relatively shorter and more slender. The last four pairs shortened as in the male. Length of podomeres: $3 > 6 > 2 > 5 = 4$.

"*Orthomorpha*" *coxisternis* Pocock

1895 *Orthomorpha coxisternis* Pocock, Ann. Mus. civ. Stor. nat. Genova 34: 811, fig. 12.

Material.

This species was based on a single female specimen which has been re-examined in the Genoa Museum: Bharno, coll. L. FEA, 1 ♀ holotype.

Description.

Colour. — See POCK.

Width. — 2.9 mm.

Head and antennae. — Labrum tridentate; the emargination rather deep and moderately wide. Clypeus moderately convex, moderately impressed towards the labrum; the lateral border widely convex, distinctly emarginate near the labrum. Headplate rugulose to smooth, shiny; pubescence rather dense to moderate up to the lower part of the vertex, middle of vertex with a pair of hairs. Antennal

sockets separated by slightly more than the diameter of a socket or by three quarters of the length of the 2nd antennomere. Postantennal groove rather deep and wide; the wall in front moderately prominent. Vertex rather convex; the sulcus moderately impressed, running downward to between the antennal sockets. Antennae of moderate length, moderately stout, scarcely clavate. Pubescence moderate proximally to rather dense distally. Length of antennomeres: $2 = 3 > 4 > 5 > 6$; the 6th antennomere only one seventh shorter than the 2nd.

Collum. — (fig. 39). A little wider than the head, subsemicircular in dorsal outline. Anterior border widely rounded, slightly more strongly rounded towards the sides. Posterior border weakly and widely emarginate, a little convex towards the lateral sides and a little concave again above the lateral rounding. Lateral border slightly asymmetrically rounded. Surface shiny, polished, hairless. The marginal rim narrow laterally, fading away towards the middle of the anterior border. Surface transversely almost evenly convex, scarcely flattened in the middle.

Somites. — Moderately constricted. Prosomites silky, distinctly demarcated from the stricture. Stricture of moderate width, the posterior part finely ribbed down to the level of the lateral keels, finely striate below that level. Metatergites shiny, smooth. Transverse furrow deep and rather wide, finely striate, present from the 5th to the 18th somite, weak also on the 4th. A short median impression immediately caudad of the stricture. In some somites there is a transverse row of four

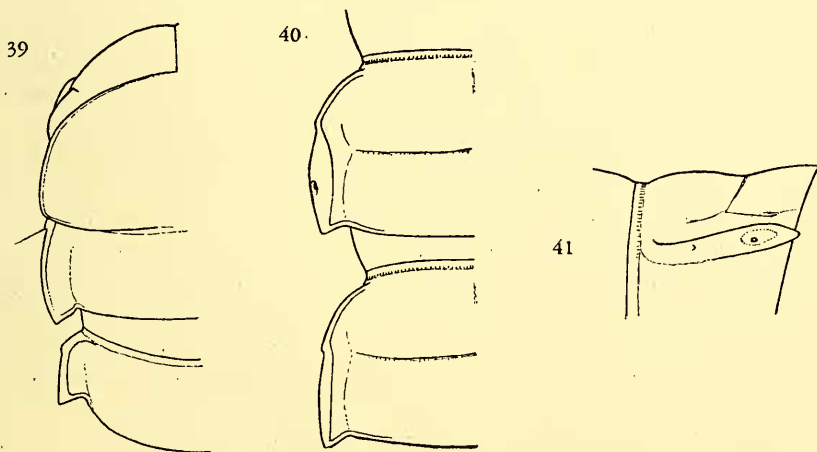


Fig. 39—41. "*Orthomorpha*" *coxisternis* Pocock, holotype ♀. — 39: left side of the head and three anterior somites, dorsal aspect. 40: left side of the 10th and 11th somites, dorsal aspect. 41: left side of the 10th somite, lateral aspect

minute granules in front of the transverse furrow. Sides finely granulate. Pleural keels in the 2nd, 3rd and 4th somites represented by strong ridges, which are caudally produced into an obtusely angular lappet. In the 3rd somite the lappet projects a little behind the margin of the somite, in the 4th it just reaches that margin. 5th somite with an obtusely angular lappet near the caudal margin, not

produced posteriorly. Towards the 10th somite this lappet gradually disappears.

Lateral keels. — (fig. 39—41). 2nd somite a little wider than the collum; the 3rd a little narrower than the 2nd, and about equal to the 4th. Keels of the 2nd somite below the level of those of the 3rd, declined. Anterior border slightly thrust forward, faintly convex. Latero-anterior angle obtuse. Lateral border widely rounded, anteriorly with a weak notch bearing a hair. Posterior border practically straight, slightly notched at the base. Latero-posterior edge about right-angled, projecting distinctly caudad of the margin of the somite. Marginal rim of moderate width, weakly demarcated posteriorly. Keels of the 3rd and 4th somites rather widely to widely rounded, each with a distinct latero-anterior tooth, dorso-ventrally thicker than the keels of the 2nd somite. Posterior edges slightly acutely angular, projecting a little behind the border of the somite, though scarcely in the 4th somite. Keels of the 5th and subsequent somites widely rounded, with a distinct latero-anterior notch. Posterior edge right-angled in the 5th somite, acutely angular from the 6th onwards, projecting a little caudad of the margin of the somite. In the 15th, and particularly in the 16th to 19th somites the posterior edge becomes more sharply pointed, though not conspicuously spiniform. Poriferous keels having the marginal rim distinctly widening caudad of the latero-anterior notch. Pores latero-dorsal in a slight ovoid concavity. At least in the posterior half of the keels the marginal rim is also ventrally demarcated by a furrow.

Sternites and legs. — Middle sternites only slightly longer than broad. Cross impressions distinct, well impressed; both furrows of equal depth. No sternal cones. Pubescence moderate. Legs rather long, moderately slender. Pubescence of the four basal podomeres ventrally moderate, dorsally sparse to practically absent; only the tibiae and tarsi rather densely setiferous all around. Length of podomeres: $3 > 6 > 5 = 2 > 4$; the 6th podomere seven eighths of the length of the 3rd.

Anal somite. — Epiproct of moderate length and width. The sides converging concavely, almost parallel near the end. Basal setiferous tubercles distinct; distal setiferous tubercles rather distinct, situated close to the end. The end with a pair of rather short, thick, bluntly rounded knobs which are separated by a narrow concavity. Ventral side of epiproct a little concave. Valves somewhat rugulose. Setiferous tubercles large and flat; the rims narrow and moderately high. Hypoproct broad: an obtusely angular triangle with widely rounded sides. Setiferous tubercles projecting slightly behind the margin, but not equalling the middle.

Remarks.

POCOCK (l.c.: 807) already noted the isolated position of this species within the genus *Orthomorpha* Bollman, 1893, and I can only confirm his opinion. "*O.*" *coxisternis* certainly does not belong to *Orthomorpha* in the current conception of that genus. Neither could I associate it generically with any of the other Burmese paradoxosomatids.

As such, the species has no outstanding characters. Nevertheless it presents a combination of characters which suggests a relationship with the genera *Tetra-centrosternus* Poc. and *Pocockina* g. n. Possibly it will ultimately prove to belong to a not yet recognized generic type belonging to the group of Southeast Asian Paradoxosomatidae in which the femora of the first pair of legs of the males are provided with a ventral tubercle.

"Orthomorpha" bisulcata Pocock

1895 *Orthomorpha bisulcata* Pocock, Ann. Mus. civ. Stor. nat. Genova 34 : 808.

Not :

1903 *Orthomorpha bisulcata* ; Attems, Zool. Jahrb. (Syst.) 18 : 64.

Material.

This species was based on two female specimens which are both in the Genoa Museum. Obviously the specimen from Rangoon was regarded as the type by POCK; consequently I have designated this as lectotype. The specimen from Meteleo I have labelled as paratype.

Rangoon, coll. L. FEA, 1 ♀ lectotype; Carin Cheba, Meteleo, coll. L. FEA, 1 ♀ paratype.

Description.

Colour. — See POCK.

Width. — Lectotype ♀ : 2.5 mm; paratype ♀ : 2.4 mm.

Head and antennae. — Labrum widely and rather deeply emarginate, tridentate. Clypeus moderately convex, strongly impressed towards the labrum; the lateral border widely emarginate. Headplate shiny, rather densely to moderately setiferous up to the lower half of the vertex; middle of vertex with two hairs. Antennal sockets separated by one and a half times the diameter of a socket, or by almost half the length of the 2nd antennomere. Postantennal groove deep and rather wide; the wall in front rather prominent. Vertex rather convex; the sulcus well impressed, not reaching the upper level of the sockets. Antennae rather long, moderately slender, moderately clavate. Pubescence moderate in the proximal antennomeres to rather dense in the distal ones. Length of antennomeres: $3 > 4 = 2 > 5 > 6$; the 6th antennomere two thirds of the length of the 2nd.

Collum. — Reniform in dorsal outline; narrower than the head. Anterior border widely rounded, a little more strongly so towards the lateral sides. Posterior border widely emarginate, laterally faintly convex. Lateral border asymmetrically rounded, the latero-posterior edge obtuse and narrowly rounded. Surface shiny, smooth; a few dispersed hairs. A weak transverse furrow is present. Marginal rim very narrow laterally, practically absent anteriorly. Transverse convexity of collum weak in the middle, much stronger towards the sides.

Somites. — Rather strongly constricted. The prosomites somewhat dulled by a fine cellular structure. Stricture of moderate width, distinctly demarcated from the prosomites, coarsely beaded dorsally down to about halfway the lateral sides becoming indistinctly striate below. Metatergites more shiny than the prosomites. Transverse furrow deep and wide, finely and indistinctly striolate, present from the 2nd to the 19th segment. A rather deep median furrow behind the transverse furrow, and a similar but weaker furrow in front of the transverse furrow. A few anterior metatergites with some dispersed hairs. Sides up to the 6th or 7th somite very coarsely granulate-tuberculate in the lower half, and up to the 12th or 13th somite with a few dispersed minute granules, otherwise smooth. Pleural keels present only in the 2nd, 3rd and 4th somites. In the 2nd and 3rd somites they are ending caudally in a distinct triangular lappet projecting ventrad. In the 4th somite only a tuberculate ridge.

Lateral keels. — 2nd somite a little wider than the collum; 3rd somite a little narrower than the 2nd, and equal to the 4th. Keels of the 2nd somite below the level of those of the 3rd, strongly declined, almost vertical. The anterior border widely rounded; at the latero-anterior edge a strong tooth projecting downwards. Lateral border widely rounded, a little undulate. Posterior border narrow, straight. Latero-posterior edge obtusely angular, weakly produced caudad and scarcely projecting beyond the margin of the somite. Marginal rim narrow but distinct.

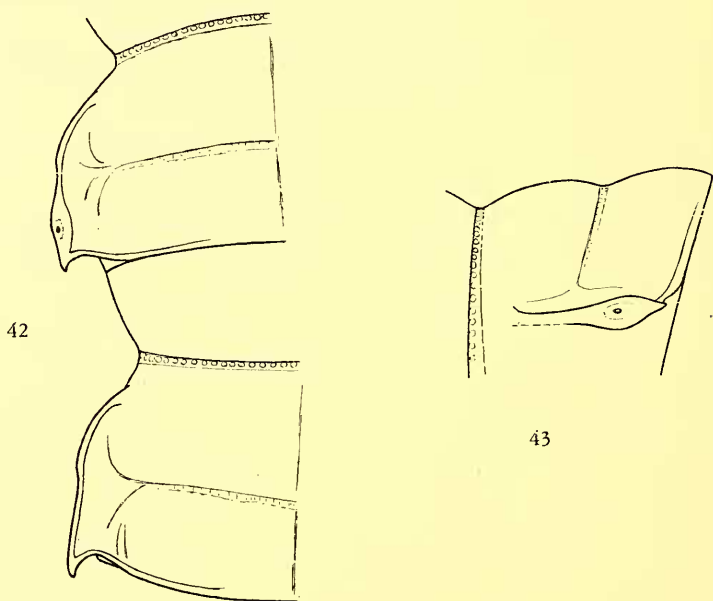


Fig. 42—43. "*Orthomorpha*" *bisulcata* Pocock, lectotype ♀. — 42: left side of the 10th and 11th somites, dorsal aspect. 43: left side of the 10th somite, lateral aspect

Keels of the 3rd somite also on a rather low level. Border anteriorly narrowly rounded, laterally widely rounded; no latero-anterior tooth. Posterior border narrow and a little concave. Latero-posterior edge about right-angled, projecting slightly caudad of the margin of the somite. Marginal rim narrow. Keels of the 4th somite similar to those of the 3rd, but the anterior rounding wider. The latero-posterior edge slightly acute-angled, not projecting behind the margin of the somite. Keels of the 5th and subsequent somites (fig. 42—43) with the anterior border widely rounded. The lateral border a little emarginate in the middle but without distinct tooth in front of the emargination. Posterior edges acute-angled and projecting a little behind the margin from the 11th somite onwards, although scarcely in the 19th somite. From about the 11th or 12th somite the posterior edges become more spiniform or uncatate, the spines curving inwards a little. Marginal rim of keels narrow, widening around the pore which lies in a distinct, elliptical excavation.

Sternites and legs. — Sternite in middle somites one and a quarter times longer

than broad. Cross impressions well developed; the longitudinal furrow almost as deeply impressed as the transverse furrow. No sternal cones. Pubescence moderately dense, the hairs rather long. Legs rather long, slender. The 1st pair somewhat incrassate; the last legs not modified. Pubescence moderate, but rather dense in the tarsi. Length of podomeres: $3 > 6 > 5 = 2 > 4$; the 6th podomere six sevenths of the length of the 3rd.

Aanal somite. — Epiproct rather broad and short, rather thick. The sides converging concavely, not parallel before the end. Preterminal lateral tubercles distinct. The end moderately narrow, truncate and faintly emarginate; no terminal knobs. Basal setiferous tubercles rather weak. Ventral side of epiproct not concave. Valves shiny, rugose. The marginal rims of moderate width and height. Setiferous tubercles weakly developed. Hypoproct trapezoidal, with the sides concave and the posterior border practically straight. Setiferous tubercles absent, the setae arising simply from the edges.

Remarks.

Like the foregoing species, *bisulcata* stands isolated and cannot be assigned to any of the known Burmese genera. The species has some particular features, like a transverse furrow from the collum to the 19th somite as well as a longitudinal furrow, the coarse beads of the stricture, the conspicuously coarse granulation of the sides, the structure of the lateral keels, etc., which in combination may well allow of a generic allocation, eventually.

It may be possible that this species too belongs to a genus of the group of *Tetracentrosternus*, *Pocockina*, etc., but only the discovery of the male of this or of a closely related species can solve the problem.

ATTEMS (1903) recorded this species from Java, Tjibodas, but this record, published without any comment, for mere geographical reasons must have been based on a misidentification.

REFERENCES

- ATTEMS, C., 1898. System der Polydesmiden, I. Theil. Denkschr. k. Akad. Wiss., math.-naturw. Cl. 67 : 221—482, pl. 1—11.
 ———, 1903. Beiträge zur Myriopodenkunde. Zool. Jahrb. (Syst.) 18 : 63—154, pl. 5—11.
 ———, 1936. Diplopoda of India. Mem. Ind. Mus. 11 : 133—323.
 ———, 1937. Polydesmoidea I, Fam. Strongylosomidae. Das Tierreich 68 : I—XXII, 1—300.
 ———, 1938. Die von Dr. C. Dawydoff in französisch Indochina gesammelten Myriopoden. Mém. Mus. Nat. Hist. nat. (n.s.) 6 : 187—353.
 ———, 1940. Croisière du Bougainville aux Iles Australes Françaises, VI. Myriopodes. Mém. Mus. Nat. Hist. nat. (n.s.) 14 : 271—282.
 ———, 1953. Myriopoden von Indochina. Expedition von Dr. C. Dawydoff (1938—1939). Mém. Mus. Hist. nat. (n.s.) [A] 5 : 133—230.
 CARL, J., 1902. Exotische Polydesmiden. Rev. Suisse Zool. 10 : 563—679, pl. 10—12.
 ———, 1922. Diplopoden aus Sumatra, Java, Malakka und Ceylon. Zool. Jahrb. (Syst.) 44 : 565—578.
 ———, 1932. Diplopoden aus Süd-Indien und Ceylon. 1. Teil. Polydesmoidea. Rev. Suisse Zool. 39 : 411—529.
 ———, 1935. Polydesmiden gesammelt von Major R. W. Hingston auf der III. Everest-Expedition, 1924. Rev. Suisse Zool. 42 : 325—340.
 ———, 1941. Orientalische Polydesmiden. Rev. Suisse Zool. 48 : 359—376.

- CHAMBERLIN, R. V., 1921. New Chilopoda and Diplopoda from the East Indian Region. *Ann. Mag. nat. Hist.* (9) 7 : 50—87.
- HOFFMAN, R. L., 1963. A contribution to the knowledge of Asiatic Strongylosomoid Diplopoda (Polydesmida : Strongylosomatidae). *Ann. Mag. nat. Hist.* (13) 5 : 577—593.
- HUMBERT, A., 1865. Essai sur les Myriapodes de Ceylan. *Mém. Soc. phys. Hist. nat. Genève* 18 : 1—62, pl. 1—5.
- JEEKELE, C. A. W., 1963. Paradoxosomatidae from Borneo (Diplopoda, Polydesmida). *Tijdschr. Ent.* 106 : 205—283.
- , 1964. Two new species of *Pratinus* Attems, with taxonomic notes on the genus and a redescription of its type-species (Diplopoda, Polydesmida). *Beaufortia* 11 : 61—73.
- , 1964. Notes on the genus *Akamptogonus* Attems, with descriptions of a new genus and species from New Guinea (Diplopoda, Polydesmida). *Nova Guinea, Zool.* 29 : 105—113.
- , 1965. A revision of the South American Paradoxosomatidae in the Museo Civico di Storia Naturale di Genova (Diplopoda, Polydesmida). *Ann. Mus. civ. Stor. nat. Genova* (in press).
- PETERS, W., 1864. Übersicht der im Königl. zoologischen Museum befindlichen Myriopoden aus der Familie der Polydesmi, so wie Beschreibungen einer neuen Gattung, *Trachyulus*, der Juli und neuer Arten der Gattung *Siphonophora*. *Monatsber. k. Akad. Wiss. Berlin* 1864 : 529—551.
- POCOCK, R. I., 1890. On the Myriopoda of Burma. Pt. 1. Report on the Oniscomorpha collected by Sig. L. Fea, by Mr. E. W. Oates and by the late Sig. G. B. Gomotto. *Ann. Mus. civ. Stor. nat.* 30 : 384—395.
- , 1892. Report upon two collections of Myriopoda sent from Ceylon by Mr. E. E. Green, and from various parts of Southern India by Mr. Edgar Thurston, of the Government Central Museum, Madras. *J. Bombay nat. Hist. Soc.* 7 : 131—174, pl. 1—2.
- , 1893. On the Myriopoda of Burma. Pt. 3. Report on the Julidae, Chordeumidae and Polyzonidae collected by Sig. L. Fea and Mr. E. W. Oates. *Ann. Mus. civ. Stor. nat. Genova* 33 : 386—406.
- , 1895. The Myriopoda of Burma, Pt. IV. Report upon the Polydesmoidea collected by Sig. L. Fea, Mr. E. W. Oates and others. *Ann. Mus. civ. Stor. nat. Genova* 34 : 787—834.
- , 1896. Supplementary note upon the Juloidea, containing descriptions of three new species. *Ann. Mus. civ. Stor. nat. Genova* 36 : 349—352.
- VERHOEFF, K. W., 1930. Über einige Chilognathen aus Ceylon, nebst vergleichend-morphologischen Notizen. 117. Diplopoden-Aufsatz. *Zool. Anz.* 89 : 193—210.
- , 1936. Ueber einige Indische Chilognathen gesammelt von Herrn S. Jones, Madras. *Rec. Ind. Mus.* 38 : 103—123, pl. 5—8.
- , 1937. Zur Kenntnis indisch-ostasiatischer Diplopoden, Polydesmoidea. *Zool. Anz.* 120 : 306—319.
- , 1939. Diplopoden der Insel Mauritius und ihre zoogeographische Bedeutung. *Jena. Zeitschr. Naturw.* 73 : 37—96, pl. 2—6.
- WEIDNER, H., 1960. Die entomologischen Sammlungen des Zoologischen Staatsinstituts und Zoologischen Museums Hamburg. III. Teil. Chilopoda und Progoneata. *Mitt. Hamburg. Zool. Mus. Inst.* 58 : 57—104.